FACT SHEET FOR STATE WASTE DISCHARGE PERMIT ST- 5369

City of Pasco

Industrial Wastewater Treatment Facility

SUMMARY

Process wastewater from three vegetable/potato processors is collected, screened, and pumped to an 1152 acre center-pivot sprayfield system for treatment. Wastewater produced during the winter season is stored in a lined 110 million gallon storage pond equipped with aerators for odor control. The treatment system came online in 1995 and has received an average monthly flow of 1.11 MGD.

Wastewater nitrogen and water loads, and the total annual wastewater volume have been well below the design capabilities of the treatment system.

Nitrate concentrations in most all of the downgradient wells exceed the ground water criteria. Values for total dissolved solids have generally increased in all of the wells since 1996 when sampling began.

Ground water data shows that the sprayfield site can be divided into a northern and southern area, where nitrate and TDS concentrations are highest and exceed their respective ground water criteria values beneath the northerly fields, while values for both parameters are near or less than the criteria values beneath the southerly fields. A recently installed upgradient well appears to represent background conditions only for the northern fields. An existing "downgradient" well appears to best represent background conditions for the southern area.

Background ground water quality for nitrate and TDS at each upgradient well generally exceeds the ground water criteria for each parameter. This is somewhat typical for this area due to past irrigation and farming practices associated with various cash crops. To comply with the state's ground water standards and water pollution law, enforcement limits equal to the background values for the northern and southern areas of the sprayfield site were placed into the permit.

Some changes in ground water testing (less frequent sampling and elimination of some test parameters) and sprayfield system monitoring were added to the permit. Changes to the system since its completion support the decision to require the submittal of an updated O&M manual.

(NOTE: See Response to Comments for changes)

TABLE OF CONTENTS

INTRODUCTION

This fact sheet is a companion document to the draft State Waste Discharge Permit No. **ST-5369** . The Department of Ecology (the Department) is proposing to issue this permit, which will allow discharge of wastewater to waters of the State of Washington. This fact sheet explains the nature of the proposed discharge, the Department's decisions on limiting the pollutants in the wastewater, and the regulatory and technical bases for those decisions.

Washington State law (RCW 90.48.080 and 90.48.162) requires that a permit be issued before discharge of wastewater to waters of the state is allowed. Regulations adopted by the state include procedures for issuing permits (Chapter 173-216 WAC), and water quality criteria for ground waters (Chapter 173-200 WAC). They also establish requirements which are to be included in the permit.

This fact sheet and draft permit are available for review by interested persons as described in Appendix A--Public Involvement Information.

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in these reviews have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Changes to the permit will be addressed in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Pasco
Facility Name and Address	Industrial Wastewater Treatment Facility P.O. Box 293 Pasco, WA 99301
Type of Facility	Municipally owned land treatment system designed for industrial/commercial food processors
Type of Treatment:	Spray irrigation via center pivots onto approximately 1200 acres
Discharge Location	Latitude: 46° 17' 40" N Longitude: 119° 03' 51" W.
Legal Description of Application Area	SE ¼ of Section 34, T. 10, R. 30; NW ¼ of Section 12, and Section 9,3,11, T. 9, R. 30 E.W.M Latitude: 46° 17' 35" N. Longitude: 119° 02' 24" W.
Contact at Facility	Name: Rod Merry Telephone #: 509-544-3083

GENERAL INFORMATION	
Responsible Official	Name: Bob Alberts Title: Public Works Director, City of Pasco Address: P.O. Box 293 Telephone #: 509-545-3446 FAX # 509-545-3499

BACKGROUND INFORMATION

DESCRIPTION OF THE FACILITY

HISTORY

The City of Pasco constructed its industrial wastewater treatment facility in 1995 to receive and treat process wastewater from a vegetable processor (J.R. Simplot) that was locating in the Pasco industrial area (Fig 1). The area is located north of the city along state hiway 395 at the intersection with Foster Wells Road (Fig 2). The wastewater land treatment site is located approximately one mile east of the industrial area. Since the startup of the treatment facility, two additional vegetable processors have been added to the system; Reser's Fine Foods and Twin City Foods.

INDUSTRIAL PROCESSES

Currently, J.R. Simplot processes a variety of different vegetable products (corn, carrots, potatoes, beans) and discharges year around. Twin City Foods processes only corn and discharges primarily during August and September. Reser's Fine Foods produces a variety of different potato products and discharges year around. All have been issued state waste discharge permits with discharge limits for maximum average flow and total annual nitrogen loading that are based on the design capacities of the industrial facility.

There is no oil based cooking at any of the facilities.

TREATMENT PROCESSES

Each of the dischargers to the system provides screening of the wastewater before discharging. Additional pretreatment includes sedimentation to remove dirt and magnesium hydroxide injection for pH control. All wastewater from the users gravity flows to a common 10,000 gallon wet well/lift station where it is screened. Pumps capable of pumping a peak capacity of 3600 gpm (5.184 MGD; Fig 2) send the water to the lagoon/sprayfield site via a twin force main comprised of an 8" and 16" line located along E. Foster Wells Road. An in-line meter measures the flow from the wet well.

Depending on the time of year the raw wastewater is either pumped directly to an irrigation pump station to be sent directly to the sprayfields, to a lined (60 mil HDPE) and aerated five million gallon flow equalization basin and then to the irrigation pump station, or to a lined and aeration equipped 110 million gallon pond that provides 90 days of storage during the winter months.

Wastewater can be irrigated at full strength or mixed with supplemental well water by control valves at concentrations determined by the operator. Well water is available from one of nine irrigation wells. Back flow preventors have been installed in the well lines.

From wastewater information received in monthly Discharge Monitoring Reports (DMRs) submitted by the city for the period August 1999 to August 2003, average monthly flows to the

lagoon/sprayfield site ranged from 0.2 to 3 MGD. Total annual flows ranged from 380 to 458 million gallons.

SPRAYFIELD SYSTEM

The sprayfield system is comprised of 10 center pivot irrigation circles that totals approximately 1150 acres (Fig 2). The description and design of the treatment system was presented in an engineering report (Hickerson-Jacobs, Inc., Esvelt Environmental Engineering, 1990) and finalized in Revision No. 1 to Supplement No. 2 of the engineering report (HDR Engineering, 1997). The finalized report used actual wastewater flow and chemical data, and an updated cropping plan for the pivot fields. The design capacities are:

Average flow for maximum month	7.6 MGD
Total annual flow	718.7 MG
BOD_5 load for the maximum month	260,000 lbs/day
Total annual total-N loading	538,776 lbs

A review of the wastewater data submitted in DMRs (January 1999- August 2003; Appendix 1) and the annual Farm Circle Reports, shows that the facility has operated below the design criteria:

	Avg flow for max month (MGD)	Total Annual Flow (MG)	Avg. BOD load for max month (lbs/day)	Total annual N load (lbs) [1]	Total annual wastewater N load (lbs)
1999	3.03	458	57,722	392,893	272,667
2000	2.85	380	59,251	371,860	241,810
2001	2.7	423	75,702	514,326	486,756
2002	2.99	411	68,466	325,437	178,354
[1] Gross nitrogen load from wastewater + fertilizer + irrigation water					

The maximum yearly values for average flow and BOD loading occurred during the period August – October for each year and coincided with the corn processing season. J.R. Simplot processes corn year around, but Twin City Foods only operates during the corn season and is the major contributor to the wastewater system during this period. For the 2002 season, Twin City Foods processed approximately 234 million pounds of corn.

GROUND WATER

A cursory hydrogeologic investigation of the sprayfield site was conducted during the design of the sprayfield system (Shannon & Wilson, 1992) and was based on existing well log information. Eight monitoring wells were subsequently installed in 1995 (one up- and seven downgradient; Fig. 2) and sampling began in June 1996. All wells were screened in the uppermost water bearing zone.

To better describe the hydrogeology of the site the current permit required the submittal of a Hydrogeologic Report as per Ecology's ground water guidance (Ecology, 1996). A report was completed and submitted to Ecology (Landau Associates, 2000) with the following results:

1. Columbia River basalts are overlain with silts (25-50 ft thick), sands and gravels (60-100 ft thick). A discontinuous silt unit (5-10 ft thick) extends below the sands and gravels. Well graded sands and gravels (up to 95ft thick) are below the silt unit and is where the downgradient wells are screened.

2. The basalt bedrock slopes downward toward the west

3. The lithology of the area near the upgradient well (MW1) is different. The discontinuous silt layer is approximately 100ft above the silt layer in the area of the downgradient wells.

4. The unconfined ground water is located over the basalt and flows at a rate of approximately 0.004 ft/ft in a southwesterly direction.

5. MW1 was not constructed in the same hydrogeologic unit as the downgradient wells.

6. The discontinuous silt unit would intercept any infiltrated water and direct it's flow in the direction of its spatial orientation. Infiltrated ground water would make its way to the deeper ground water where the silt unit is not present. No perched ground water was observed during the drilling of the monitoring wells. All wells were completed below the silt unit.

7. It is recommended that one additional monitoring well be constructed upgradient of the spray field site.

8. The existing downgradient wells are sufficient to measure downgradient ground water conditions.

An amended hydrogeologic study was submitted to the city as part of its contract with its consultant (Landau Associates, 2003). The purpose of the report was to compile ground water data from the newly installed upgradient well (MW9; April 2001), estimate background ground water conditions, and compare these values to the conditions at the downgradient wells.

The report concluded that MW9, the new upgradient well, was properly installed and completed in the same water bearing unit as the downgradient wells. Background ground water values for nitrate and TDS (32.7 mg/L and 696 mg/L) at MW9 exceeded the respective ground water criteria for these parameters. Generally, values for nitrate and TDS in the downgradient wells were less than the background values.

GROUND WATER QUALITY

Ground water data collected from August 1999 through August 2003 and submitted to Ecology in monthly Discharger Monitoring Reports (DMRs) was analyzed for quality relative to the ground water standards and trends (Appendix 2).

Water level elevations in all of the downgradient wells have been similar throughout the reporting period and fairly consistent with very little seasonal variations (Fig A2.1). It is clear that the water level at MW1 is different from all of the downgradient wells and corresponds to the findings in the 2000 HG report that it is not in the same water bearing zone as the downgradient wells. Monitoring of MW1 was stopped at the end of year 2000 because of the findings of the HG report and a resulting modification to the permit's testing requirements.

A review of the cation (sodium, calcium, potassium, magnesium) and anion (bicarbonate, chloride, sulfate, and nitrate) concentration data for the downgradient wells shows that bicarbonate is the primary anion in the ground water, followed by sulfate and chloride. The primary cation appears to be calcium, followed by sodium and magnesium. The groundwater appears to be a calcium bicarbonate water.

A cation/anion charge balance analysis determined a large difference between the summation of the cations (meq/L) and anions (meq/L). This suggests that other ions are present but are not being tested for; silicates, iron, manganese.

Nitrate is the predominate nitrogen species at all downgradient wells. Values for TKN and ammonia have consistently been less than 0.5 mg/L.

Ground water data for the downgradient wells was graphed in "well groupings" (MW3,6,8 and MW 2,4,5,7) like those in the 2000 HG report, and compared to the ground water criteria and evaluated for trends; Figs. A2.2 and A2.3; Appendix 2).

Nitrate: With the exception of MW6, all downgradient wells generally have nitrate concentrations above the ground water standard of 10 mg/L (Fig. A2.2 & A2.3). Average values for the reporting period ranged from 9.7 mg/L at MW6 to 30 mg/L at MW8.

Values at MW7 and MW8 show an increasing trend for the August 99-August 2003 reporting period. This agrees with the trend analysis in the 2000 HG report. A visual examination of the 1996-2003 data shows that nitrate values at MW7 and MW8 have steadily increased. Nitrate concentrations measured in August 1996 for MW7 and MW8 were 16.9 and 13.9 mg/L, respectively. Values measured in August 2003 were 29.3 and 31.3 mg/L, respectively.

Nitrate values at MW2 and MW3 show a slight decreasing trend for the Aug 99-Aug 03 reporting period (Fig. A2.2 & A2.3). This is a reversal of the slight increasing trend that was reported in the HG report for the May 96-May 2000 period.

Nitrate values for MW4, MW5, and MW6 showed no general trend and were near 10 mg/L throughout the Aug 99-Aug 2003 period. This generally agrees with the values collected during May 96-May 2000 and reported in the 2000 HG report.

Total Dissolved Solids: Values at MW4, 5, and 6 were consistently less than the ground water standard (500 mg/L) for the reporting period. All of these wells show a general decreasing trend; Fig. A2.4 & A2.5. Average values for the period were 432, 457, and 433 mg/L, respectively.

The decreasing trends for these wells differ from the May 96-May 2000 data reported in the 2000 HG report which showed very noticeable increasing trends.

TDS values for MW2, 3, 7, and 8 were consistently above the ground water standard for the Aug 99 – Aug 03 reporting period. Average values ranged from 563 mg/L at MW2 to 600 mg/L at MW8. Values at MW2 showed an increasing trend while values at MW3, MW7 and MW8 showed slight decreasing trends.

TDS concentrations at all downgradient wells have generally increased since the beginning of sampling in 1996 when use of the sprayfields for wastewater treatment began. August values (mg/L) show this increase: **(NOTE: See Response to Comments for changes)**

	Aug 1996	Aug 2003
MW2	340	518
MW3	290	500
MW4	250	405
MW5	320	408
MW6	290	419
MW7	310	592
MW8	360	571

Ground Water Quality Trends

An overall view of the nitrate and TDS data across the sprayfield site shows an apparent pattern. Drawing a NE to SW diagonal line across the site between MW3 and MW4 (Fig. 2) divides the sprayfield site into a northern area (fields VI-X) where the wells have average nitrate and TDS values greater than the ground water criteria, and a southern area (fields I-V) where average values for both parameters are less than their respective ground water criteria. The 2003 amended HG report also made this observation.

In an effort to explain the higher ground water concentrations of nitrate and TDS beneath the area under fields VI-X, nitrogen load and nitrogen removal values were evaluated for all sprayfields from data submitted in annual Farm Circle Reports from 1997-2002. Overall, the results showed only two fields had more nitrogen added than was removed by the crop; the northern fields VI and IX. All other sprayfields showed more nitrogen removed by the crops than was applied.

Soils test data for each sprayfield was also evaluated to determine if nutrients were being flushed through the soil column. The 2002 Farm Circle Report graphically presents trends in soil nitrate values from samples collected at several locations within each field, at various depths from 1-20 feet, and collected in the Spring and Fall, 1999 to 2002. There does not appear to be any clear or obvious indications of increasing nitrate concentrations with soil depth at any field.

Ecology's staff hydrogeologist evaluated the information presented in the 2003 amended HG report (Landau, 2003) in an effort to explain the difference in groundwater values for nitrate and TDS between the northerly and southerly fields. While no definitive answer was found for this trend, there appears to be a "break" or change in direction of ground water flow in the vicinity of MW-3 between the northern and southern fields.

The 2003 HG report suggested that the difference in ground water quality in the northern and southern fields was due to the discontinuous silt layer in the vicinity of MW-1. The layer perches the ground water and its spatial orientation directs the perched water to flow from the north to the south.

GROUND WATER QUALITY – BACKGROUND CONDITIONS

In response to the findings and recommendations of the 2000 HG report, the Permittee installed a new upgradient ground water monitoring well (MW9) in April 2001; sampling started in May. It is located in the NE corner of Section 2, T. 9N, R 30 E.W.M.; Fig. 2. Data from this well could be used to determine background ground water quality and enforcement limits to protect the ground water.

The ground water standards (WAC 173-200) were adopted to, in part, "..maintain the highest quality of the state's ground waters and protect existing and future beneficial uses of the ground water..". One way to achieve this goal is contained in the antidegradation policy of the standards. This policy mandates the protection of background water quality and prevents degradation of water quality which would harm a beneficial use or violate the ground water standards. Whenever ground waters are of a higher quality than the standards, the existing water quality (background) shall be protected.

The statistical procedure for estimating the background water quality is contained in Ecology's guidance for implementing the ground water standards (Ecology, 1996). Background water quality is a statistical determination and is defined as the 95 percent upper tolerance interval with a 95% confidence. Ground water data for MW-9 was used to determine the background water quality for nitrate and TDS as per the ground water guidance procedure. These parameters are pollutants in vegetable and potato wastewater that have a high potential to leach from the root zone and have ground water criteria values that must be protected.

A statistical analysis of the MW-9 data (May 2001 – August 2003; n=10) for both parameters showed there were no outlier values and no significant trends (increasing or decreasing) in either of the databases.

The 95 percent upper tolerance values ($\alpha = 0.05$) for nitrate and TDS were determined to be:

Nitrate = 33 mg/L
TDS = 673 mg/L

These background values are similar to values determined in the 2003 amended HG report (32.7 and 696 mg/L, respectively), and exceed their respective ground water criteria values; 10 and 500 mg/L. As per the ground water standards and implementation guidance, whenever the background concentration exceeds the criteria, the background concentration becomes the criteria and the ground water quality in the down gradient wells shall not exceed this criteria value; i.e., non-degradation.

When compared to the average nitrate and TDS values at the downgradient wells (Appendix 1), it appears clear that the MW-9 background water quality values for nitrate and TDS are very similar to the average values at the downgradient wells for northern sprayfields (VI-X), but are much higher than the average values at the downgradient wells for the southern fields (I-V). Given the differences in the ground water quality between the northern and southern fields described previously, and the location of MW-9 in the northern portion of the site, it appears that MW-9 is more representative of background conditions for the northern fields.

Using the MW-9 background values for nitrate and TDS (33 and 673 mg/L, respectively) for the entire site would essentially allow the southern fields to be operated in a manner that could increase the current ground water quality for nitrate from approximately 10 mg/L in the southern fields downgradient wells to 33 mg/L, and TDS from 450 mg/L to 673 mg/L. This would not meet with the goal of the ground water standards to, "....provide for the protection of the environment and human health and protection of existing and future beneficial uses...".

Given the location of the current monitoring wells and the ground water flow direction, it has been decided to use MW-6 to represent background ground water conditions for the southerly fields. It is recognized that MW-6 is somewhat cross-gradient to the southern fields, but its location, and concentrations of nitrate and TDS make it more representative of the background ground water quality for the southern fields than MW-9.

A statistical analysis of the MW-6 data (August 1999 – August 2003; n=28) was performed as per Ecology's ground water guidance to determine the background conditions. The 95 percent upper tolerance values ($\alpha = 0.05$) for nitrate and TDS were determined to be:

Nitrate = 11.98 mg/L
TDS = 495.7 mg/L

Downgradient vs Background ground water criteria

A) S outhern fields:

Downgradient well values for nitrate (MW-4 and -5) were generally less than the background value (Fig. 3). Values at MW-4 in early 2002 exceeded the background value for two consecutive sampling periods. For permit enforcement purposes, Ecology's ground water guidance (Ecology, 1996) defines an exceedance of the background value for two consecutive sampling periods to be a violation of the ground water criteria.

Total dissolved solids values in the downgradient wells have also been less than the background value; Fig. 4. No violations of the background value would have been detected if they had been in effect during the current permit cycle.

B) Northern fields:

Most nitrate values in the downgradient wells (MW-2, -3, -7, -8) plotted below the background value at MW-9; Fig. 5. Nitrate values at MW-8 in late 2002 and early 2003 would have been in violation of the water quality criteria.

Downgradient TDS values plotted below the background value; Fig. 6. There was never an instance of an exceedance of the criteria value for two consecutive sampling periods.

PERMIT STATUS

The previous permit for this facility was issued on July 15, 1999. The permit was modified in March 2001 to change the ground water monitoring schedule in response to a request by the permittee and based on information presented in the 2000 Hydrogeologic report.

An application for permit renewal was submitted to the Department on December 5, 2003 and accepted by the Department on January 15, 2004.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

During the history of the previous permit, the Permittee has generally remained in compliance based on Discharge Monitoring Reports (DMRs) and other reports submitted to the Department and inspections conducted by the Department.

A review of the annual Farm Circle Reports that were submitted as required by the current permit showed that not all of the required information has been reported in the plans. Specifically, salt loadings and salt balances for each field, water balances for each field, leaching requirements, and crop testing results.

WASTEWATER CHARACTERIZATION

The concentration of pollutants in the raw wastewater delivered to the lagoon site (combined flows of J.R. Simplot, Twin City Foods, Reser Fine Foods), and the wastewater irrigated onto the sprayfields were reported in the permit application and in discharge monitoring reports (DMRs). The proposed wastewater discharge to the sprayfields is characterized for the following parameters as reported in DMRs for the period Jan 99 – Aug 03; Appendix 1. The data is from flow proportional composite samples collected at the irrigation pump station.

Table 1: Irrigation Wastewater Characterization

Parameter	Concentration
Flow (mgd)	Avg = 1.54; Range = 3.0 - .028
Total Nitrogen (lbs/day)	Avg = 938; Range = 65 - 6083
BOD (lbs/day)	Avg = 19,546; Range = 201 - 75,702
TDS (mg/L)	Avg = 998; Range = 533 - 3335
Total Sodium (mg/L)	Avg = 43; Range = 26 - 70
Total Calcium (mg/L)	Avg = 26; Range = 22 - 34
Total Magnesium (mg/L)	Avg = 15; Range = 11 - 22
Total Potassium (mg/L)	Avg = 140; Range = 42 - 142
Chloride (mg/L)	Avg = 35; Range =27 - 45

PROPOSED PERMIT LIMITATIONS

State regulations require that limitations set forth in a waste discharge permit must be either technology- or water quality-based. Wastewater must be treated using all known, available, and reasonable treatment (AKART) and not pollute the waters of the State. The minimum requirements to demonstrate compliance with the AKART standard were determined in Revision #1 to Supplement #2 (HDR Engineering, Inc., 1997) of the 1990 engineering report (Hickerson-Jacobs, Inc., & Esvelt Environmental Engineering), the farm management plan for the sprayfield site (RUST Environment & Infrastructure, 1995,1996), Technical Memorandum – City of Pasco IWWTP Land Application Site Capacity (Cascade Earth Sciences, 1997), and the revised 2002-2006 crop plan (City of Pasco, 2003) in conformance with *Guidelines for the Preparation of Engineering Reports for Industrial Wastewater Land Application Systems*, May 1993.

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

All waste discharge permits issued by the Department must specify conditions requiring available and reasonable methods of prevention, control, and treatment of discharges to waters of the state (WAC 173-216-110). The following permit limitations are necessary to satisfy the requirement for AKART:

1. Wastewater shall be land applied via spray irrigation not to exceed agronomic rates (as defined in the Department's ground water implementation guidance) for total nitrogen and water, and at rates for other wastewater constituents that are protective of background ground water quality.

2. Total nitrogen and water shall be applied to the sprayfields as determined by a current irrigation and crop plan.

3. The system must be operated so as to protect the existing and future beneficial uses of the ground water and not cause a violation of the ground water standards.

GROUND WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's ground waters including the protection of human health, WAC 173-200-100 states that waste discharge permits shall be conditioned in such a manner as to authorize only activities that will not cause violations of the Ground Water Quality Standards. The goal of the ground water quality standards is to maintain the highest quality of the State's ground waters and to protect existing and future beneficial uses of the ground water through the reduction or elimination of the discharge of contaminants to ground water [WAC 173-200-010(4)]. This goal is achieved by [GW Implementation Guidance, Abstract, page x]:

1. Requiring that AKART (all known available and reasonable methods of prevention, control and treatment) be applied to any discharge;

2. Application of the antidegradation policy of the ground water quality standards. This policy mandates protecting background water quality and preventing degradation of water quality which would harm a beneficial use or violate the ground water standards; and

3. Establishing numeric and narrative criteria for the protection of human health and welfare in the ground water quality standards.

Numeric ground water criteria (maximum contaminate concentrations) are based on drinking water quality criteria. Applicable criteria concentrations are listed below:

Ground Water Quality Criteria

Total Dissolved Solids	500 mg/L
Nitrate (as N)	10 mg/L

The intent of the ground water quality standards is to protect background water quality to the extent practical, rather than to allow degradation of ground water quality to the criteria. The procedures for estimating background water quality are contained in the Guidance Document for Implementing the Ground Water Standards (Ecology, 1996). Background water quality is defined as the 95 percent upper tolerance interval with a 95 percent confidence.

ENFORCEMENT LIMIT

The policy of the state's Water Pollution Control Law (RCW 90.48) is, in part, "..to maintain the highest possible standards to insure the purity of all waters of the state..". This antidegradation policy is implemented by the ground water standards (WAC 173-200) which help insure the purity of the state's ground waters and protects the natural environment.

The ground water quality standards apply to all activities that have a potential to adversely impact ground water quality. In general, Ecology considers land treatment systems to have a potential to impact ground water. While nitrogen and water load values have generally been below the design values for the sprayfield site, there is still a potential to impact ground water at

the sprayfield site, given the composition of the soils (sands and gravels) and the depth to ground water (105-180 feet).

To protect existing ground water quality and to prevent ground water pollution, the ground water standards provide for the establishment of enforcement limits. Enforcement limits are regulatory threshold values that are determined on a case-by-case basis and are generally established at a level less than the ground water criteria. These limits represent the maximum allowable concentration of a particular substance which can be detected at a specified point of compliance, and are generally established at a level less than the criteria.

Whenever the background water quality is greater than the criteria value, then the background value becomes the criteria, and this value is not to be exceeded. In other words,

Enforcement Limit = Background water quality

This is the case for the Pasco Industrial sprayfield site.

To comply with the state's water pollution control law and the intent of the ground water standards to protect the background ground water quality at the sprayfield site, the permit will contain enforcement limits that are equal to the background ground water quality. For the Pasco industrial sprayfield site, they are:

Northern fields: nitrate = 33, and Total dissolved solids = 673 mg/L

Southern fields: nitrate = 12 mg/L, and Total dissolved solids = 496 mg/L.

(NOTE: See Response to Comments for changes)

POINT OF COMPLIANCE

According to the ground water standards, the point of compliance with the enforcement limit should be located "..in the ground water as near and directly downgradient from the pollutant source as technically, hydrogeologically and geographically feasible." The point of compliance is determined on a site specific basis for each discharge facility and generally is located no further than the property boundary of the site. The point of compliance is not necessarily limited to one well, but may include an array of wells.

The ground water implementation guidance (Ecology, 1996) describes what must be considered when locating the point of compliance. Based on the guidance and information contained in the 2000 HG report, all of the downgradient wells (MW-2 to MW-5, and MW-7, -8) are considered points of compliance.

Ecology's ground water guidance defines a violation of an enforcement limit as, two consecutive exceedances of an enforcement limit for the same parameter at the same well. The Permittee is required to immediately (within 48 hrs) resample and verbally notify Ecology of a violation. The Permittee is also required to provide written notification of the violation in the monthly discharge monitoring report, and prepare a report that documents the conditions of the violation and discuss options to reduce the impacts. All of these requirements will be in the proposed permit. **(NOTE: See Response to Comments for changes)**

PERMIT CONDITIONS

Based on the information presented in the HG report, the analysis of the ground water data, and the chemical make up of the wastewater, it has been determined that there is a potential for impact to the ground water. The enforcement limits for nitrate and TDS that have been determined will be placed into Section S1 of the permit. The Point of Compliance with the limits shall be at MW-2, -3, -7, and -8 for the northern fields, and MW-4 and MW-5 for the southern fields.

COMPARISON OF LIMITATIONS WITH THE EXISTING PERMIT ISSUED JULY 15, 1999

Table 3: Comparison of Previous and New Limits

Parameter	Existing Limits	Proposed Limits
Total annual flow to the sprayfields	718.70 MG	718.70 MG
Average flow for the maximum month	7.6 MG	7.6 MG
BOD_5 loading for the maximum month	260,000 lbs/day	260,000 lbs/day
Total annual nitrogen loading	538,766 lbs	538,766 lbs
Ground water enforcement limits:	None	
Northern fields:		Nitrate-N = 33 mg/L TDS = 673 mg/L
Southern fields: **(NOTE: See Response to Comments for changes)**		Nitrate-N = 12 mg/L TDS = 496 mg/L

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are specified to verify that the treatment process is functioning correctly, that ground water criteria are not violated, and that effluent limitations are being achieved (WAC 173-216-110).

WASTEWATER MONITORING

The monitoring schedule is detailed in the proposed permit under Condition S2. Specified monitoring frequencies take into account the quantity and variability of the discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

Changes to the irrigated wastewater monitoring will include the following:

1. The elimination of COD testing: The COD test procedure generates hazardous wastes that are expensive to dispose of, and sufficient information is available to develop a relationship between BOD_5 and COD for the irrigated wastewater. A linear regression

analysis was performed on values reported in DMRs for the period Aug 1999 – Aug 2003 (n=69) with the following results:

$COD = 1.8327(BOD_5) + 658.91 \qquad R^2 = 0.71$

2. The elimination of conductivity testing.

3. The replacement of "Fixed Dissolved Solids" for "Total Dissolved Solids". Values for FDS better represent the inorganic salt content of the wastewater, whereas TDS includes both organic and inorganic salts. The organic fraction of the wastewater is already tested for in the BOD_5 test. Values for FDS will also allow a better understanding of the salt loading to the sprayfields.

CROP MONITORING

The current permit requires composite samples be collected from each center pivot field. Samples shall be comprised of at least ten (10) random samples from each harvest. The Department has determined that this is a reasonable request for crops such as alfalfa, grass, wheat, mint, and related types for the determination of nutrient uptake and developing nutrient balances.

For crops that are less "grain/grass" type (i.e., non-forage crops) and have a large amount of vegetative growth (e.g., corn, potatoes), the Department has decided to allow the use of literature values for nutrient uptake for use in the determination of nutrient uptake and developing nutrient balances.

Nutrient uptake is important because it allows for the determination of whether or not agronomic rates are being exceeded, which is a permit limitation as described in Section S1 of the permit.

SOIL MONITORING

Soil monitoring of the sprayfields is necessary for several reasons: to evaluate trends in the accumulations of root zone nutrients and salts at various depths to determine potential impacts to ground water and plant growth; plan for nitrogen loading based on residual values at the beginning of the growing season; determine salt accumulations and the need for leaching to control salt toxicity.

Soil samples have been collected in the Spring and Fall, and analyzed for nitrate, pH, and conductivity at one foot depth intervals (1-6ft). These values are reported in the annual update of the farm plan. Trend analysis graphs for nitrate at the different depths are also reported. This requirement will continue in the proposed permit. **(NOTE: See Response to Comments for change)**.

A once per permit cycle extensive soil testing requirement (cation/anions; ESP; CEC; organic matter) at the 1-6 and 10 ft depths will also be extended to the proposed permit.

GROUND WATER MONITORING

The monitoring of ground water at the site is required in accordance with the Ground Water Quality Standards, Chapter 173-200 WAC, and to determine compliance with the ground water enforcement limits.

The testing schedule for ground water in the proposed permit will be modified from that in the current permit:

1. Testing for TKN and ammonia will be eliminated. Values for both parameters reported for all wells have most always been at or below the testing method detection level of 0.5 mg/L.
2. "Static water level elevation" will replace "static water level depth"
3. Testing will continue at MW-9
4. Eliminate "Total Alkalinity" testing. Given the pH of the ground water, the results of the bicarbonate testing will represent most of the total alkalinity of the ground water.
5. Increase the frequency of nitrate and TDS testing from "4/year" to "1/month". The increase in testing frequency is needed to determine compliance with the new ground water enforcement limits.

The 2003 amended HG report recommended eliminating sampling of MW-4; no reason was given. Ecology believes that MW-4 is an integral part of the downgradient monitoring system and that continued testing is necessary to evaluate compliance with the newly derived enforcement limits.
(NOTE: See Response to Comments for changes)

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The conditions of S3 are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-216-110).

FACILITY LOADING

The design criteria for this treatment facility are taken from Revision No. 1 to Supplement No. 2 of the engineering report prepared by Hickerson-Jacobs, Inc., and Esvelt Environmental Engineering (1990) and are as follows:

Monthly average flow (max. month):	7.60 mgd
Total annual flow	718.70 MG
BOD_5 loading (max. month)	260,000 lbs/day
Total annual nitrogen load:	538,776 lbs

The permit requires the Permittee to maintain adequate capacity to treat the flows and waste loading to the treatment plant (WAC 173-216-110[4]). For significant changes in loadings to the treatment works, the permit requires a new application and an engineering report (WAC 173-216-110[5]).

FARM MANAGEMENT PLAN - UPDATE

A technical memorandum (Cascade Earth Sciences, 1997) was submitted by the city which updated the original 1996 farm plan and defined the nitrogen, BOD, and hydraulic capacities for the site. These values were based on the crop needs for a five year rotation (1998-2002).

The city submitted an updated plan that described the crop rotation for the period 2002-2006 in a letter dated January 23, 2003.. The plan relies heavily on growing alfalfa on most fields during each crop rotation year. The estimated crop nitrogen uptake values for the five year plan range from 559,000 – 612,000 lbs. These uptake values are well in excess of the maximum design load of 538,776 lbs.

FARM CIRCLE REPORTS

Annual Farm Circle Reports submitted over the past permit cycle have been limited in their scope and generally only describe the nitrogen balance for each field. There has been essentially no information presented for water or salt loading, crop uptake, or leaching fraction. The absence of this data makes it difficult to determine compliance with the permit requirement (Section S1) to apply water and nutrients at agronomic rates.

Given the increase in nitrate and TDS in the groundwater since the facility began operation in 1996, more information is needed in the circle reports to insure that the fields are being operated as originally designed and described in the 1992 Land Application Plan for the site (Bezdicek and Granatstein, 1992). This additional information is also needed to help explain the discrepancy between increased downgradient nitrate and TDS in the downgradient wells, and nitrogen loads being less than the design value and no apparent increasing trends in the soils data.

Therefore, in addition to requiring the determination and reporting of the salt and water balance information for each field, the following additional information will be required in the annual Farm Circle Reports:

1. The nitrogen load from the supplemental well water will continue to be made part of the total nitrogen balance analysis for each field. The 1992 design plan pointed out that nitrates in the area's ground water is elevated and that well water nitrates "..must be considered in determining total N loading."

2. The "leaching fraction" must be determined and reported for each field. The 1992 design plan concluded that some net leaching of water is necessary to prevent salt accumulation in the root zone and toxicity to the crops. Leaching should also be timed to coincide with low soil nitrate concentrations. The plan recommended a "leaching requirement" of 7.6-11.5%.

3. Ground water trend analysis: A continuous three year trend analysis for nitrate and TDS at all downgradient wells will be reported, and compared to their respective enforcement limit values. The trend analysis will start with the 2002 well data.

To help insure that this additional information is provided, Section S2 of the permit (MONITORING REQUIREMENTS) will have a new section entitled, "Farm Circle Report Monitoring". It will contain a list of irrigation and crop management tests that will be required and be reported in the annual Farm Circle Report. This information will help insure that the sprayfield system is being operated as designed, and allow for a better understanding of nutrient and water loading to the system.

The permit will also require the submittal of a revision to the updated Farm Management Plan that was submitted in January 2003. This revised plan will describe the crop rotation schedule for the 2007-2011 crop years. It will include an estimation of the annual nitrogen and TDS treatment capacity, and water requirements, and will insure that the nitrogen and water uptake will exceed their loadings.
(NOTE: See Response to Comments for changes)

OPERATIONS AND MAINTENANCE

The proposed permit contains condition S.5. as authorized under Chapter 173-240-150 WAC and Chapter 173-216-110 WAC. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

The Permittee submitted an O&M manual for the treatment facility in May 1999 that was required by the current permit. The manual was dated June 1996 (RUST Environment & Infrastructure) and was written immediately following the construction of Phase I of the treatment system, which was before the 110 MG storage pond was built and when there was only one discharger (J.R. Simplot) to the system. In response to Department comments, the Permittee submitted additional O&M information, dated September 15, 1999.

The authors of the manual suggested that the manual be updated whenever such changes occur, like the addition of new users to the system, substantial modification of the Farm Management Plan, discharge permit requirements, analysis of sprayfield data, or modification of system components. The addition of Twin City Foods and Reser's Fine Foods to the system, changes in the original farm plan, two different discharge permit cycles (8 years) since facility startup, the apparent increase in nitrogen and salts in the ground water since the startup of the facility, and improvements in the system components since the facility was put on-line (110 million gallon storage pond), all contribute to the need for an update of the 1996 O&M manual.

Section S5 of the permit will require the Permittee to submit an update to the 1996 O&M manual for Ecology review and approval that reflects the current wastewater treatment system.

GENERAL CONDITIONS

General Conditions are based directly on state laws and regulations and have been standardized for all industrial waste discharge to ground water permits issued by the Department.

Condition G1 requires responsible officials or their designated representatives to sign submittals to the Department. Condition G2 requires the Permittee to allow the Department to access the treatment system, production facility, and records related to the permit. Condition G3 specifies conditions for modifying, suspending or terminating the permit. Condition G4 requires the Permittee to apply to the Department prior to increasing or varying the discharge from the levels stated in the permit application. Condition G5 requires the Permittee to construct, modify, and operate the permitted facility in accordance with approved engineering documents. Condition G6 prohibits the Permittee from using the permit as a basis for violating any laws, statutes or regulations. Conditions G7 and G8 relate to permit renewal and transfer. Condition G9 requires the payment of permit fees. Condition G10 describes the penalties for violating permit conditions.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to control toxics, and to protect human health and the beneficial uses of waters of the State of Washington. The Department proposes that the permit be issued for five years.

REFERENCES FOR TEXT AND APPENDICES

Bezdicek, D.F. and D.M. Granatstein. 1992. Food Processing Wastewater Treatment System, City of Pasco, Land Application Management Plan. Consultants to SEC Donohue, Inc., Pasco, WA.

Cascade Earth Sciences, 1997. Technical Memorandum – City of Pasco IWWTP Land Application Site Capacity, State Waste Discharge Permit No. 5369 (Final Version). July.

City of Pasco, 2003. Transmittal letter to Ecology of revised crop rotation; 2002-2006. January

HDR Engineering, Inc. 1997. Revision No. 1 to Supplement No.2, Engineering Report, City of Pasco, Industrial Wastewater Treatment System. July.

Hickerson-Jacobs, Inc. & Esvelt Environmental Engineering. 1990. Engineering Report, City of Pasco, Industrial Wastewater Treatment System. June.

Landau Associates, 2000. Report: Hydrogeologic Study, Industrial Waste Water Treatment Facility, Pasco, Washington. September

Landau Associates, 2003. Report: Amended Hydrogeologic Study, Industrial Waste Water Treatment Facility, Pasco, Washington. October

RUST Environmental & Infrastructure. 1995. Farm Management Plan for the Land Application Area Receiving Wastewater, Industrial Wastewater Treatment Facility, City of Pasco. August.

RUST Environmental & Infrastructure. 1996. Farm Management Plan for the Land Application Area Receiving Wastewater, Industrial Wastewater Treatment Facility, City of Pasco. July.

Washington State Department of Ecology, 1993. Guidelines for Preparation of Engineering Reports for Industrial Wastewater Land Application Systems, Ecology Publication # 93-36. 20 pp.

Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
(http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Washington State Department of Ecology, 1996. Implementation Guidance for the Ground Water Quality Standards, Ecology Publication # 96-02.

APPENDICES

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

Notice of the Department's intent to renew the city's permit was published on June 26, 2003 in the Tri-City Herald.

The Department will publish a Public Notice of Draft (PNOD) in March 2004 in the Tri-City Herald to inform the public that a draft permit and fact sheet were available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
4601 North Monroe Street
Spokane, WA 99205-1295

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the thirty (30) day comment period to the address above. The request for a hearing shall indicate the interest of the party and reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-216-100). Public notice regarding any hearing will be circulated at least thirty (30) days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing.

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within thirty (30) days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509-329-3524 or by writing to the address listed above.

This Fact Sheet and the permit were written by Don Nichols.

APPENDIX B--GLOSSARY

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of the collection or treatment facility.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Distribution Uniformity--The uniformity of infiltration (or application in the case of sprinkle or trickle irrigation) throughout the field expressed as a percent relating to the average depth infiltrated in the lowest one-quarter of the area to the average depth of water infiltrated.

Engineering Report--A document, signed by a professional licensed engineer, which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Soil Scientist--An individual who is registered as a Certified or Registered Professional Soil Scientist or as a Certified Professional Soil Specialist by the American Registry of Certified Professionals in Agronomy, Crops, and Soils or by the National Society of Consulting Scientists or who has the credentials for membership. Minimum requirements for eligibility are: possession of a baccalaureate, masters, or doctorate degree from a U.S. or Canadian institution with a minimum of 30 semester hours or 45 quarter hours professional core courses in agronomy, crops or soils, and have 5,3,or 1 years, respectively, of professional experience working in the area of agronomy, crops, or soils.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, and all other surface waters and watercourses within the jurisdiction of the state of Washington.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Dissolved Solids--That portion of total solids in water or wastewater that passes through a specific filter.

Water Quality-based Effluent Limit--A limit on the concentration of an effluent parameter that is intended to prevent pollution of the receiving water.

APPENDIX C--TECHNICAL CALCULATIONS

Computer-based statistical software was used to determine background values (tolerance limits) for nitrate-N and TDS at MW-6 and MW-9 as described in Ecology's ground water guidance. The data sets used for the analysis are attached, as well as the graphical results of the analyses.

Background nitrate – MW6

Outlier analysis: It was determine on the initial run of this analysis that the Feb. 2003 nitrate value (5.6 mg/L) was an outlier, and was removed from the analysis as per the ground water guidance. The remaining data points (n=28) showed no other outlier values.

Seasonality: No seasonality in the data set (n=28) was found.

Trend Analysis: A Sen's slope analysis showed no significant trend (95% confidence level) in the data set (n=28)

Tolerance limit: The results of the parametric determination of the tolerance limit analysis shows a background nitrate value of 11.98 mg/L.

Background TDS – MW6

Outlier analysis: No outliers of log-transformed data (n=28)

Seasonality: No seasonality found.

Trend Analysis: Trend not significant at the 95% level

Tolerance Limit: The results of the parametric determination of the tolerance limit analysis shows a background TDS value of 495.7 mg/L.

Background nitrate – MW9

Outlier analysis: No outliers of log-transformed data (n=10)

Seasonality: Insufficient size of the data set to perform analysis.

Trend Analysis: A Sen's slope analysis showed no significant trend (95% confidence level) in the data set (n=10)

Tolerance limit: The results of the parametric determination of the tolerance limit analysis shows a background nitrate value of 33.02 mg/L.

Background TDS – MW9

Outlier analysis: No outliers of log-transformed data (n=10)

Seasonality: Insufficient size of the data set to perform analysis.

Trend Analysis: Trend not significant at the 95% level

Tolerance Limit: The results of the parametric determination of the tolerance limit analysis shows a background TDS value of 672.8 mg/L.

PARAMETRIC TOLERANCE LIMIT MW9 (data)

Constituent: nitrate (mg/L)

Facility: Landfill X

Data File: MW9

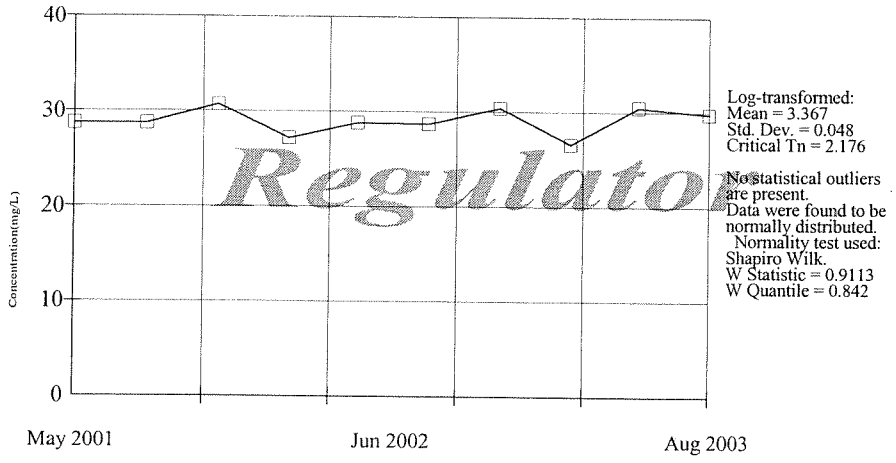
Date: 3/18/04, 9:20 AM

Client: Regulator

View: Pasco Industrial

Date	Background
05/01/01	28.7
08/01/01	28.7
11/01/01	30.7
02/01/02	27.2
05/01/02	28.8
08/01/02	28.7
11/01/02	30.4
02/01/03	26.6
05/01/03	30.5
08/01/03	29.8

OUTLIER ANALYSIS
MW9



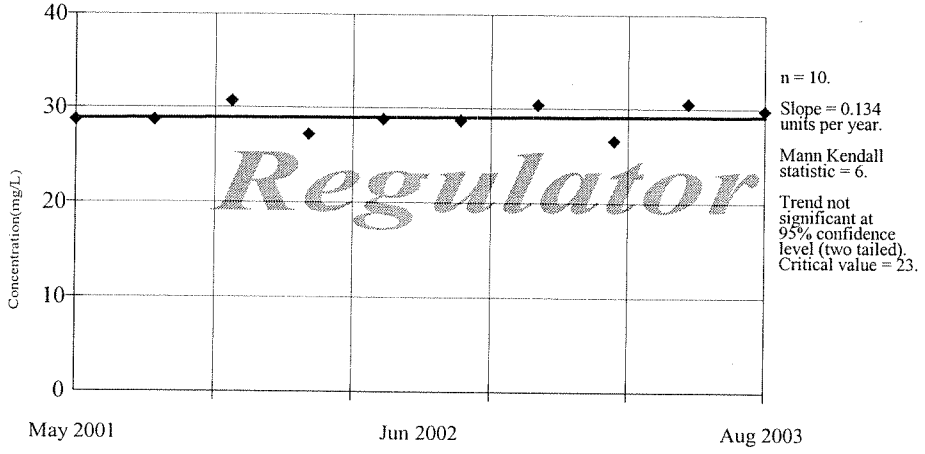
Log-transformed:
Mean = 3.367
Std. Dev. = 0.048
Critical Tn = 2.176

No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9113
W Quantile = 0.842

Constituent: nitrate (mg/L) Facility: Landfill X Data File: MW9
Date: 3/18/04, 9:18 AM Client: Regulator View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

SEN'S SLOPE ESTIMATOR
MW9



n = 10.

Slope = 0.134 units per year.

Mann Kendall statistic = 6.

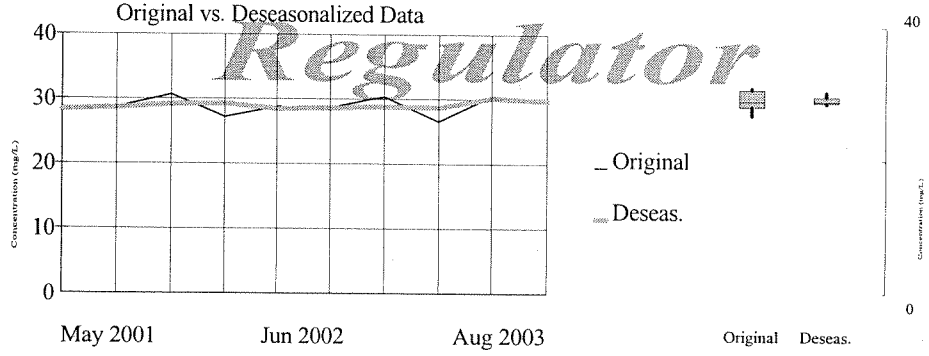
Trend not significant at 95% confidence level (two tailed). Critical value = 23.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: MW9
Date: 3/18/04, 9:19 AM Client: Regulator View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

SEASONALITY: MW9

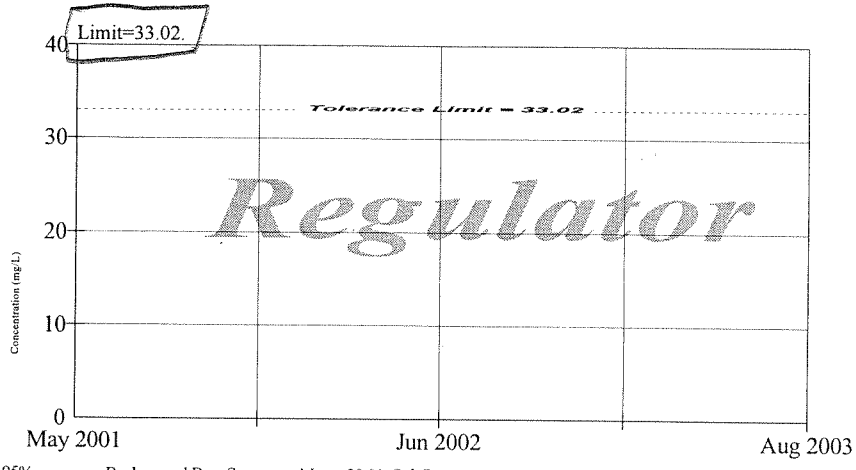
Data set is of insufficient size to test for seasonality (non-parametric ANOVA requires a minimum of three observations per group, i.e. season).



Constituent: nitrate (mg/L) Facility: Landfill X Data File: MW9
Date: 3/18/04, 9:19 AM Client: Regulator View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW9



95% coverage. Background Data Summary: Mean=29.01, Std. Dev=1.376, 0% nds, 10 obs. Normality test used: Shapiro Wilk. W Statistic for background data = 0.9113, W Quantile = 0.842. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: MW9
Date: 3/18/04, 9:20 AM Client: Regulator View: Pasco Industrial

PARAMETRIC TOLERANCE LIMIT MW9 (data)

Constituent: TDS (mg/L)

Facility: Landfill X

Data File: MW9

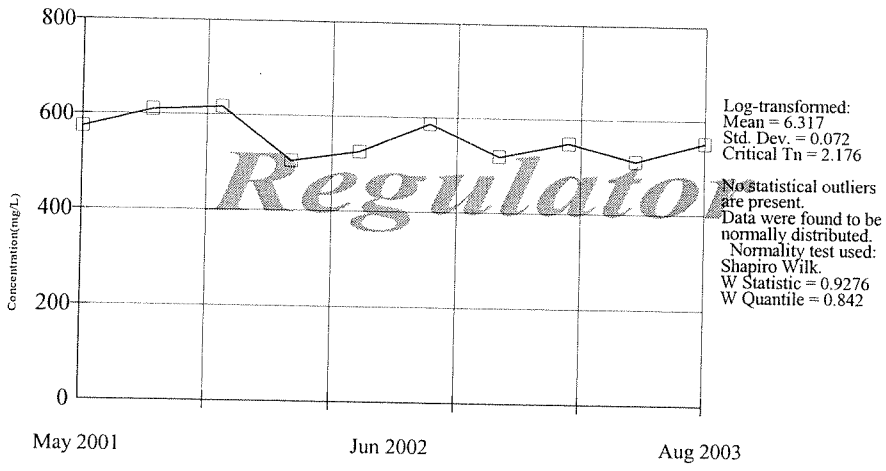
Date: 3/18/04, 9:25 AM

Client: Regulator

View: Pasco Industrial

Date	Background
05/01/01	573
08/01/01	610
11/01/01	617
02/01/02	505
05/01/02	526
08/01/02	587
11/01/02	519
02/01/03	549
05/01/03	512
08/01/03	552

OUTLIER ANALYSIS
MW9



Log-transformed:
Mean = 6.317
Std. Dev. = 0.072
Critical Tn = 2.176

No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9276
W Quantile = 0.842

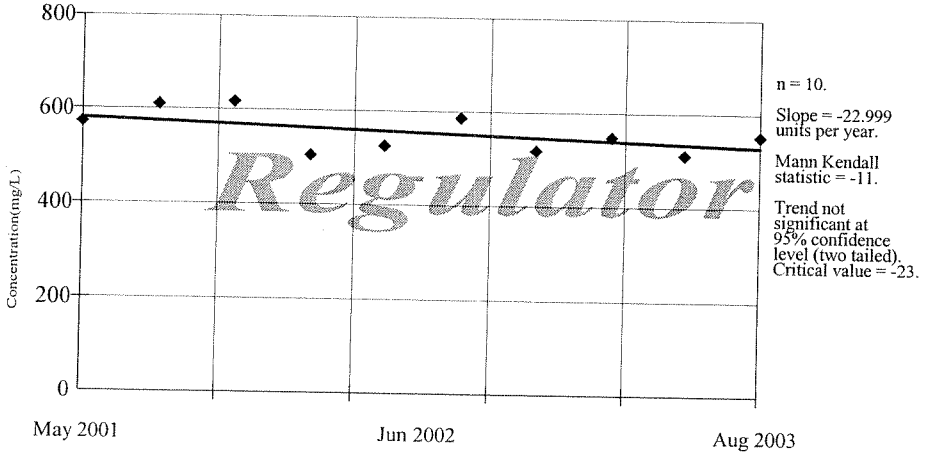
Constituent: TDS (mg/L)
Date: 3/18/04, 9:24 AM

Facility: Landfill X
Client: Regulator

Data File: MW9
View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

SEN'S SLOPE ESTIMATOR
MW9



n = 10.

Slope = -22.999 units per year.

Mann Kendall statistic = -11.

Trend not significant at 95% confidence level (two tailed). Critical value = -23.

Constituent: TDS (mg/L)
Date: 3/18/04, 9:24 AM

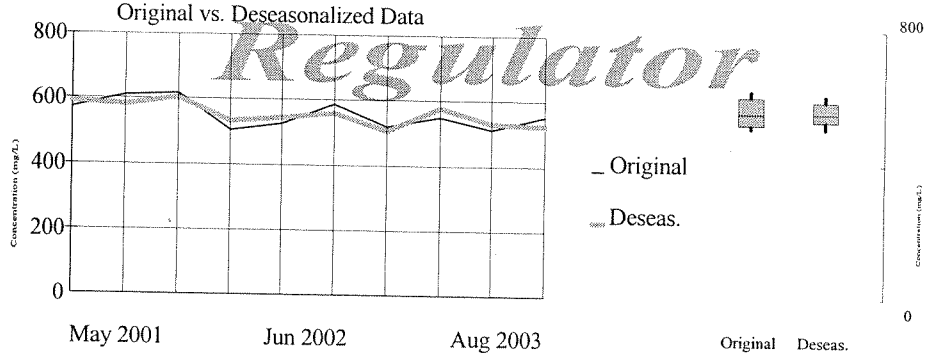
Facility: Landfill X
Client: Regulator

Data File: MW9
View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

SEASONALITY: MW9

Data set is of insufficient size to test for seasonality (non-parametric ANOVA requires a minimum of three observations per group, i.e. season).



Constituent: TDS (mg/L)
Date: 3/18/04, 9:24 AM

Facility: Landfill X
Client: Regulator

Data File: MW9
View: Pasco Industrial

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW9

95% coverage. Background Data Summary: Mean=555, Std. Dev=40.48, 0% nds, 10 obs. Normality test used: Shapiro Wilk. W Statistic for background data = 0.9276, W Quantile = 0.842. Testwise alpha = 0.05.

Constituent: TDS (mg/L)
Date: 3/18/04, 9:25 AM

Facility: Landfill X
Client: Regulator

Data File: MW9
View: Pasco Industrial

PARAMETRIC TOLERANCE LIMIT MW6 (data)

Constituent: nitrate (mg/L)

Facility: Landfill X

Data File: Pasco Ind MW6_9

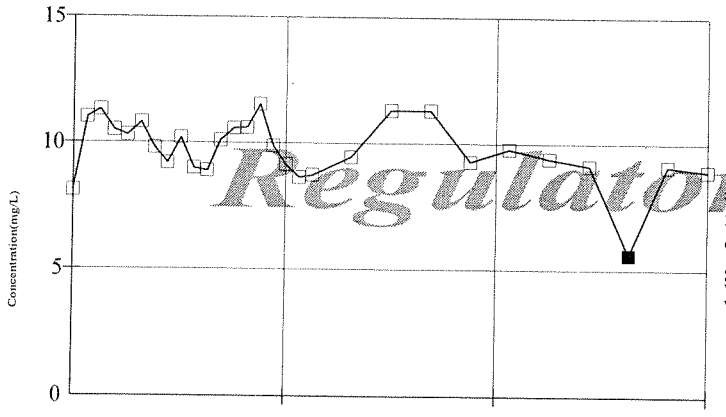
Date: 3/18/04, 9:55 AM

Client: Regulator

View: Pasco Ind background

Date	Background
08/01/99	8.11
09/01/99	11
10/01/99	11.3
11/01/99	10.5
12/01/99	10.3
01/01/00	10.8
02/01/00	9.8
03/01/00	9.2
04/01/00	10.2
05/01/00	9
06/01/00	8.9
07/01/00	10.1
08/01/00	10.57
09/01/00	10.6
10/01/00	11.52
11/01/00	9.88
12/01/00	9.16
01/01/01	8.64
02/01/01	8.74
05/01/01	9.45
08/01/01	11.3
11/01/01	11.3
02/01/02	9.28
05/01/02	9.78
08/01/02	9.4
11/01/02	9.12
05/01/03	9.1
08/01/03	8.91

OUTLIER ANALYSIS
MW6



Log-transformed:
Mean = 2.264
Std. Dev. = 0.14
Critical Tn = 2.73

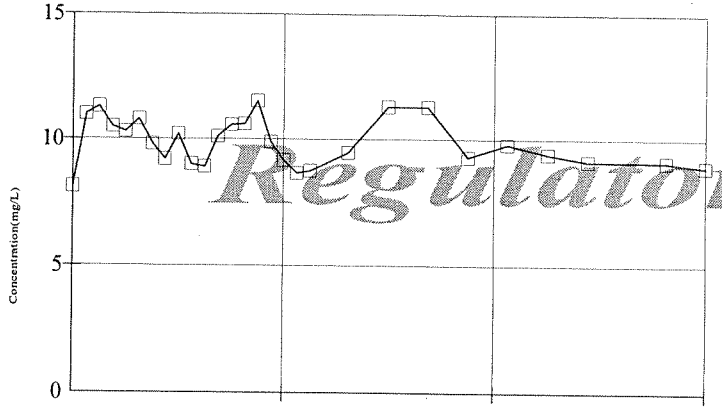
Statistical outliers are shown as solid squares. Data, after outlier removal, were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9514
W Quantile = 0.924

Note: EPA guidance directs that statistical outliers should not be removed or altered unless independent evidence of an error exists.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: Pasco Ind MW6_9
Date: 3/18/04, 9:56 AM Client: Regulator View: Pasco Ind background

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

OUTLIER ANALYSIS
MW6



Log-transformed:
Mean = 2.284
Std. Dev. = 0.096
Critical Tn = 2.714

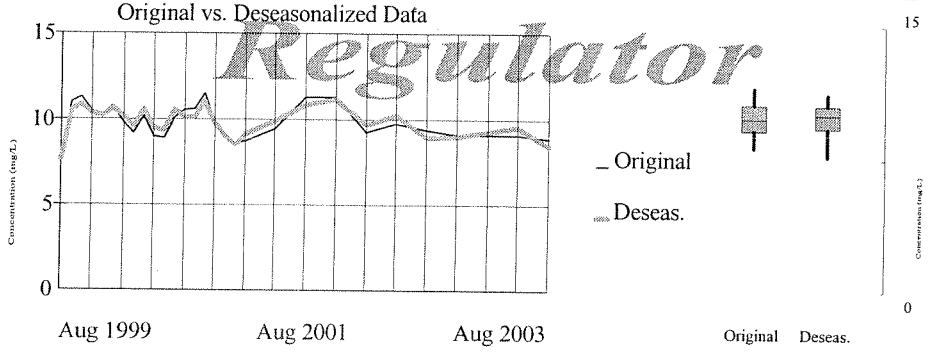
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9514
W Quantile = 0.924

Constituent: nitrate (mg/L) Facility: Landfill X Data File: Pasco Ind MW6_9
Date: 3/18/04, 9:56 AM Client: Regulator View: Pasco Ind background

v.8.02. For regulatory purposes only. CAS# n/a EPA m.a. 0.05 Sanitas™

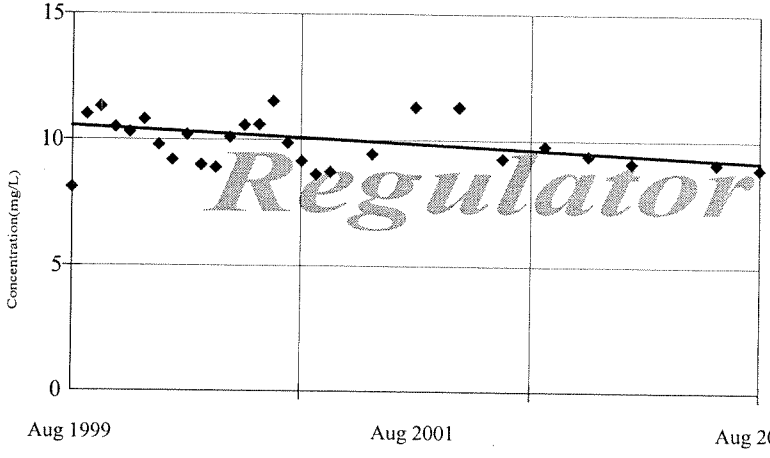
SEASONALITY: MW6

For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 4.425
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 4.420
Adjusted Kruskal-Wallis statistic (H') = 4.425



Constituent: nitrate (mg/L) Facility: Landfill X Data File: Pasco Ind MW6_9
Date: 3/18/04, 9:56 AM Client: Regulator View: Pasco Ind background

SEN'S SLOPE ESTIMATOR
MW6



n = 28.

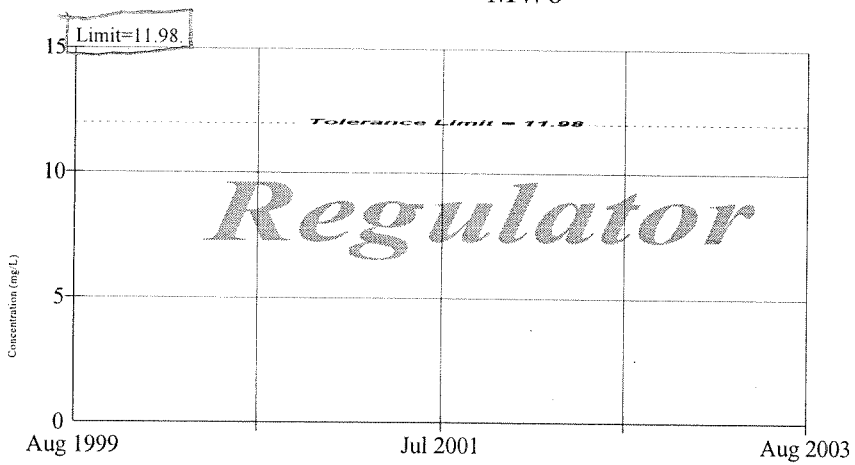
Slope = -0.343 units per year.

Mann Kendall statistic = -85.

Trend not significant at 95% confidence level (two tailed).
Critical value = -101.

Constituent: nitrate (mg/L) Facility: Landfill X Data File: Pasco Ind MW6_9
Date: 3/18/04, 9:56 AM Client: Regulator View: Pasco Ind background

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW6



95% coverage. Background Data Summary: Mean=9.856, Std. Dev=0.9454, 0% nds, 28 obs. Normality test used: Shapiro Wilk. W Statistic for background data = 0.9514, W Quantile = 0.924. Testwise alpha = 0.05.

Constituent: nitrate (mg/L) | Facility: Landfill X | Data File: Pasco Ind MW6_9

Date: 3/18/04, 9:55 AM | Client: Regulator | View: Pasco Ind background

PARAMETRIC TOLERANCE LIMIT MW6 (data)

Constituent: TDS (mg/L)

Facility: Landfill X

Data File: Pasco Ind MW6_9

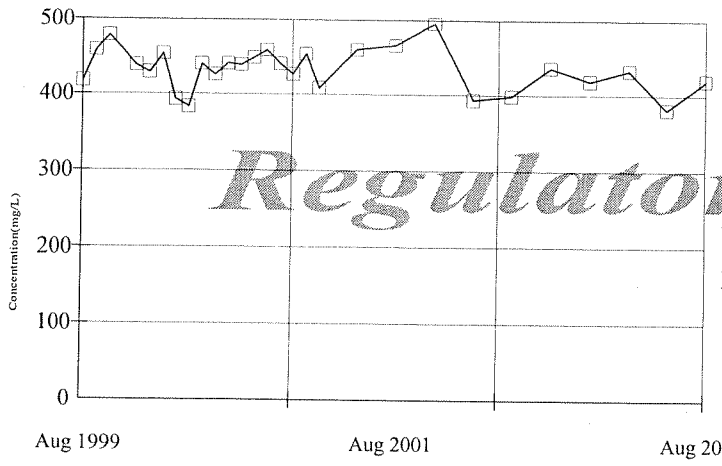
Date: 3/18/04, 9:59 AM

Client: Regulator

View: Pasco Ind background

Date	Background
08/01/99	417
09/01/99	458
10/01/99	478
12/01/99	438
01/01/00	428
02/01/00	453
03/01/00	393
04/01/00	383
05/01/00	439
06/01/00	425
07/01/00	440
08/01/00	438
09/01/00	448
10/01/00	458
11/01/00	440
12/01/00	426
01/01/01	453
02/01/01	408
05/01/01	459
08/01/01	465
11/01/01	495
02/01/02	393
05/01/02	398
08/01/02	435
11/01/02	418
02/01/03	432
05/01/03	381
08/01/03	419

OUTLIER ANALYSIS
MW6



Log-transformed:
Mean = 6.068
Std. Dev. = 0.065
Critical Tn = 2.714

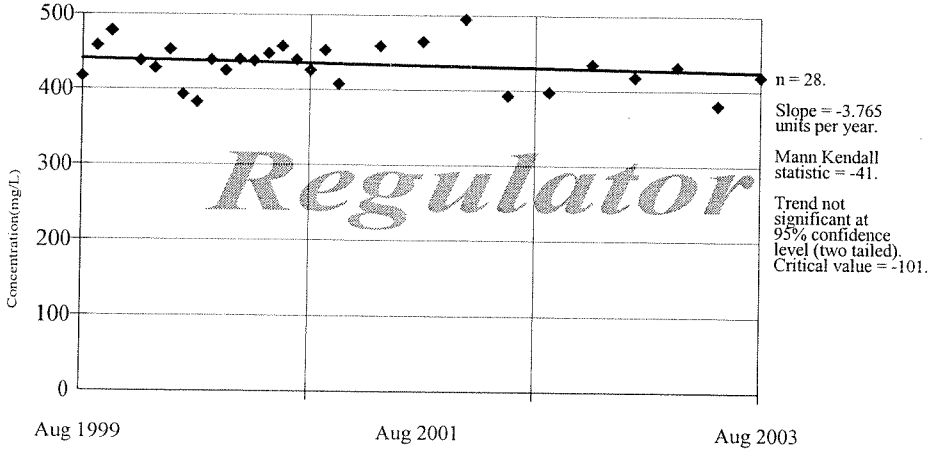
No statistical outliers are present.
Data were found to be normally distributed.
Normality test used: Shapiro Wilk.
W Statistic = 0.9777
W Quantile = 0.924

Constituent: TDS (mg/L)
Date: 3/18/04, 9:58 AM

Facility: Landfill X
Client: Regulator

Data File: Pasco Ind MW6_9
View: Pasco Ind background

SEN'S SLOPE ESTIMATOR
MW6



n = 28.

Slope = -3.765 units per year.

Mann Kendall statistic = -41.

Trend not significant at 95% confidence level (two tailed).
Critical value = -101.

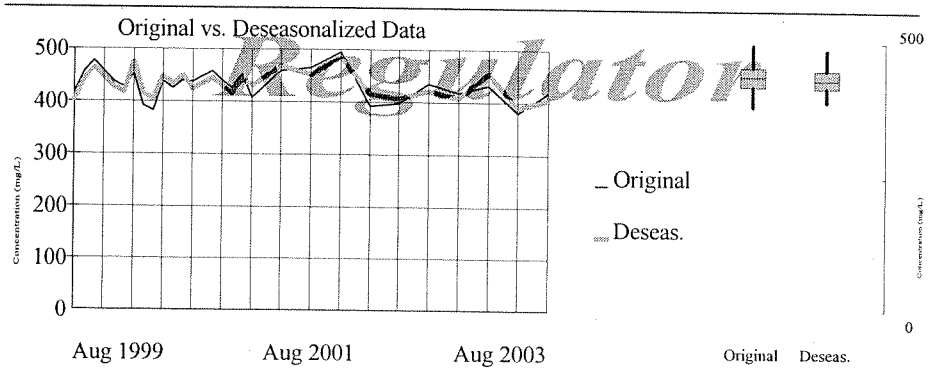
Constituent: TDS (mg/L)
Date: 3/18/04, 9:59 AM

Facility: Landfill X
Client: Regulator

Data File: Pasco Ind MW6_9
View: Pasco Ind background

SEASONALITY: MW6

For the data shown, the Kruskal-Wallis test indicates NO SEASONALITY at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no season has a significantly different median concentration of this constituent than any other season.
Calculated Kruskal-Wallis statistic = 6.112
Tabulated Chi-Squared value = 7.815 with 3 degrees of freedom at the 5% significance level.
There were 5 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.
Kruskal-Wallis statistic (H) = 6.104
Adjusted Kruskal-Wallis statistic (H') = 6.112

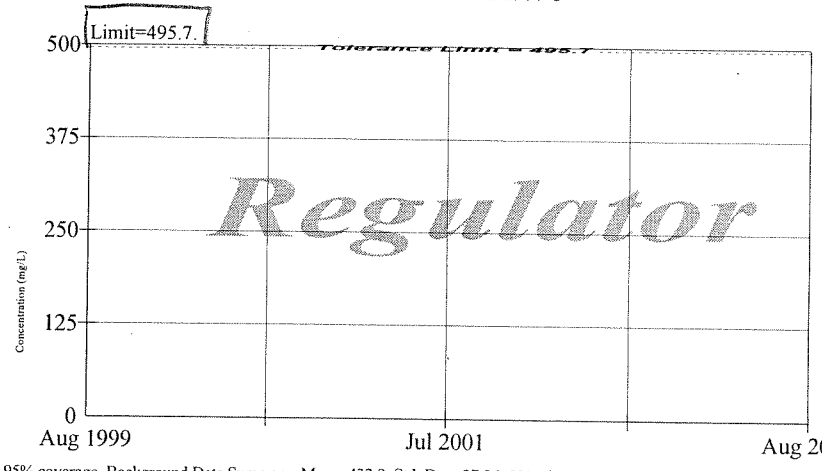


Constituent: TDS (mg/L)
Date: 3/18/04, 9:59 AM

Facility: Landfill X
Client: Regulator

Data File: Pasco Ind MW6_9
View: Pasco Ind background

PARAMETRIC INTRA-WELL TOLERANCE LIMIT
MW6



95% coverage. Background Data Summary: Mean=432.8, Std. Dev=27.96, 0% nds, 28 obs. Normality test used: Shapiro Wilk. W Statistic for background data = 0.9777, W Quantile = 0.924. Testwise alpha = 0.05.

Constituent: TDS (mg/L)
Date: 3/18/04, 9:59 AM

Facility: Landfill X
Client: Regulator

Data File: Pasco Ind MW6_9
View: Pasco Ind background

APPENDIX D--RESPONSE TO COMMENTS

Comments were received by Ecology on the draft permit from the City of Pasco, the Columbia Basin Ground Water Management Area, J.R. Simplot, and the Columbia-Snake River Irrigators Association. Ecology's responses to these comments are attached.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES

CITY OF PASCO
PUBLIC WORKS DEPARTMENT (509) 545-3444 / Scan 726-3444 / Fax (509) 545-3499
P.O. BOX 293, 525 NORTH THIRD AVENUE, PASCO, WASHINGTON 99301

APR 1 2 2004

April 6, 2004

Ms. Cynthia Wall
Eastern Regional Office
Department of Ecology
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1295

RE: City of Pasco Industrial Wastewater Discharge Draft Permit ST5369

Dear Ms. Wall:

As per our meeting and discussion with Don Nichols on March 17th at Pasco City Hall, the City would like to have Ecology make some appropriate corrections or changes to the draft permit.

The corrections or changes are as follows-

1) Pg. 8 of the draft permit outlines a change of soil monitoring from once per year to twice per year for moisture content, conductivity, and NO_3. According to the recent modification of our discharge permit ST5369, dated March 12, 2001, monitoring of the above constituents was established as being necessary once per year by Ecology. The City would like to have the requirement of monitoring corrected to once per year according to the modified permit and Ecology's previous decision.

2) Pg 10 Part F outlines several new monitoring requirements as part of the Farm Circle Report. This would result in a great deal of cost (thousands of dollars). Based on the information below for #3 (regarding the limits for groundwater), the added monitoring requirements should be withdrawn from the proposed permit and the permit remain unchanged.

3) Pg. 5 of the draft permit outlines discharge limitations set forth for Groundwater regarding Nitrates and TDS. The City requests that these discharge limitations be withdrawn from the proposed permit and the permit remain unchanged. The reasons for are as follows:

- **Nitrogen loading: Below design Criteria**
- **Nitrogen Loading vs. Removal: More Nitrogen is Removed**
- **Well Water Represents the Majority of Water Applied: Wastewater is only a Small Portion**

Response to Comment #1: Page 18 of the Fact Sheet incorrectly described the frequency of soil sampling as being twice per year; Spring and Fall. It was Ecology's intent to extend the current soil sampling frequency in the discharge permit of once per year; Fall.

Section S2.D (Soil Monitoring) in the permit will be changed to show "Annual Monitoring" instead of "Semi-Annual Monitoring", and change the sampling frequency from, "Samples will be collected at a time that best represents soil conditions at the beginning (Spring) and end (Fall) of the crop growing season", to "Samples will be collected at a time that best represents soil conditions at the end (Fall) of the crop growing season"

Response to Comment #2: The Fact Sheet section entitled, "*FARM CIRCLE REPORTS*" describes the reasons for the testing and reporting listed in Section S2.F of the permit. All of the monitoring in this section is required to allow the city to comply with the annual reporting requirements in Section S7 (FARM CIRCLE REPORT-ANNUAL), and to demonstrate compliance with Section S1 of the permit to apply nitrogen, water, and other nutrients in the wastewater at agronomic rates. The reporting requirements in Section S7 are essentially unchanged from the previous permit.

As stated in the Fact Sheet, Farm Circle Reports submitted during the past permit cycle have been limited in their scope of information. A review of the reports submitted in 2000, 2001, and 2002 show that only nitrogen balance information was presented. No information was reported that described the water and salt balance, leaching requirements, or crop test results; all of which was required by the previous permit. Without this information, Ecology can not determine compliance with the agronomic rate limit in Section S1.

The monitoring requirements in Section S2.F are needed in the new permit and were needed in the previous permit to allow the city to report the needed information in the annual Farm Circle Report. None of the testing in S2.F is new.

To assist Pasco in presenting the required information, Ecology sent a copy of a farm operations report submitted by a nearby permitted land treatment system that is similar to the city's operation.

The statement that the monitoring in Section S2.F would result in "...a great deal of cost (thousands of dollars)." is unfounded for the following reasons:

1. The first monitoring parameter, "Total annual nitrogen load to each sprayfield (wastewater + supplemental well water + fertilizer)" is determined from nitrogen testing and flow monitoring of the irrigated wastewater and supplemental water. This has been done by the city throughout the previous permit cycle and has been

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
	carried over to the new permit. This data has been reported in Farm Circle Plans since 2000. Therefore, no additional costs. 2. The second monitoring parameter, "Total annual nitrogen removed by crops for each sprayfield" is from crop monitoring that was a permit requirement in the previous permit and is carried over into the new permit. Crop monitoring for nitrogen has been reported in previous Farm Circle Plans since 2000. Therefore, no additional costs. 3. The third parameter, "Nitrogen balance for each sprayfield" is a mathematical determination and requires no analytical costs. Nitrogen balance values have been determined in previous Farm Circle Plans since 2000. Therefore, no additional costs. 4. The fourth parameter, "Estimated leaching fraction (LF) for each sprayfield", is another mathematical determination based on the total hydraulic load (wastewater, irrigation water, and precipitation), crop use (evapotranspiration), and soil water holding capacity. Hydraulic load is and has been measured by the Permittee; no additional costs. The water requirements for various crops is readily available from a variety of different resources, including the conservation district; no additional analytical costs. Based on the soils at the site, the soil water holding capacity can be obtained from the local conservation district; little or no analytical cost. Based upon previous conversations, staff from the Franklin County Conservation District have offered to compute the leaching fraction for the city; no cost. 5. The fifth parameter, "Total annual Fixed Dissolved Solids load to each field (wastewater + supplemental well water + supplemental fertilizer)", is based on flow and solids testing of the effluent that have been done by the Permittee in the past permit and have been carried over into the new permit. The only change is the replacement of "Fixed dissolved solids" for "Total dissolved solids"; minimal increase in costs. 6. The sixth parameter, "Total annual Fixed Dissolved Solids removed by crops for each field", is based on crop testing which was a requirement in the previous permit and has been carried over into the new permit; no new additional analytical costs. 7. The seventh parameter, "Fixed Dissolved Solids balance for each sprayfield" is a mathematical determination based on the difference between FDS load and FDS uptake by the crop, and requires no additional analytical costs.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
	8. The eighth parameter, "Total annual water load to each field (wastewater + supplemental + precip)" has generally been measured and reported by the Permittee during the last permit and is carried over to the new permit. Precipation values can be obtained from the national weather service or the use of an in-expensive rain collection gauge at the site; minimal additional costs. 9. The ninth parameter, "Total annual water loss for each field (crop uptake + evaporation + leached)" is a mathematical determination based on readily available information and is needed to determine the water balance for the site, which is a carry over requirement from the previous permit; no additional analytical costs. 10. The tenth parameter, "Water balance for each sprayfield" is also a mathematical determination based on readily available and/or currently measured irrigation parameters (flow); minimal costs. 11. The eleventh parameter, "Total annual wastewater BOD load to each sprayfield" is based on the BOD concentration and irrigation water flow; both were measured during the past permit and have been carried over to the new permit; no additional analytical costs. It is recognized that some additional costs would be incurred by the hiring of a soil scientist to review and approve each annual report as required by Section S7. This is a requirement in all discharge permits for land treatment systems. Soil scientist staff is available from the Franklin Soil Conservation office to help reduce costs. Based on these responses and the description of this monitoring in the Fact Sheet, Section S2.F will not be changed or removed from the new permit.

- **The Sprayfield is Removing Nitrogen from the Well (Ground) Water: The Result is Groundwater Treatment.**
- **The Amount of Nitrogen in mg/L Removed from the Well (Ground) Water is Consistent: A sign that Nitrates in the Well Water is not Increasing.**
- **Soils Test Data of Nitrate Values in Sprayfield- No Increasing Nitrate Concentrations**
- **Total Dissolved Solids are Below Ecology's Tolerance Interval and Background Value, and Concentrations are found to be Representative of the Region.**
- **Total Dissolved Solids: The Draft Permits compares TDS from 1996 and 2003 which Shows an Increase. However, Comparing Levels from 1998 through 2003 Shows Fluctuations but not Increase.**
- **Groundwater Concentrations are being Influenced from the North.**

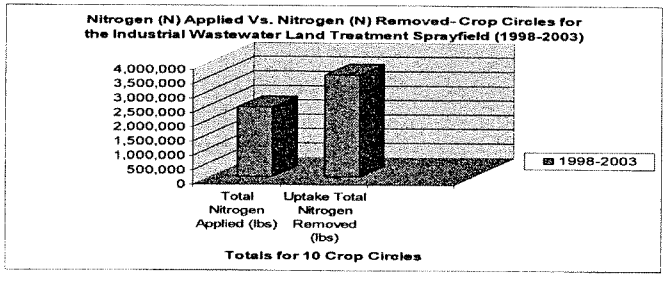
1. Nitrogen Loading: Below Design Criteria

In regards to how much nitrogen and water load (including wastewater) is applied to the sprayfield site- the summary within the fact sheet for the draft permit states: "wastewater nitrogen, water loads, and the total annual wastewater volume have been well below the design capabilities of the treatment system." In other words the sprayfield system applies both less wastewater and nitrogen then allowable by the permit.

2. Nitrogen Loading vs. Removal: More Nitrogen is Removed.

The amount of nitrogen removed vs. applied has historically shown that the sprayfield site has removed much more nitrogen from its crop circles then what has been applied. Table 1 below shows the nitrogen uptake:

Table 1



Response to Comment #3: This comment was comprised of nine parts that together, contained information to support the Permittee's position that ground water enforcement limits are not needed in the proposed new permit.

As pointed out in the comment and recognized by statements made in the permit Fact Sheet, wastewater and nitrogen loading to the sprayfield site appear to be below the crop requirements (agronomic rate). What is not known to Ecology is whether the water and total dissolved salt (TDS) loads have met the agronomic rate limit, and whether or not the amount of water leached from the root zone has met or exceeded the design amount.

As explained in the permit Fact Sheet, ground water enforcement limits were determined and placed in the permit to meet the state's water quality policy to maintain the highest possible standards to insure the purity of all waters of the state (Water Pollution Law; RCW 90.48) and the goal of the ground water standards (WAC 173-200) to protect the existing and future beneficial uses of the ground water. Ecology's ground water implementation guidance was written to, in part, promote consistent statewide implementation of the ground water standards for all activities that have a potential to impact ground water.

The ground water quality standards apply to any activity which has a potential to contaminate ground water quality. According to Ecology's ground water implementation guidance, a facility has the potential to impact ground water "..if there is a discharge of a regulated substance which is either applied at rates greater than agronomic rates or if the wastewater is stored in an impoundment (whether lined or unlined)." Ground water enforcement limits are a regulatory tool, similar to limits for discharges to surface waters, that are placed in permits to facilities with a potential to impact ground water to insure the protection of the ground water.

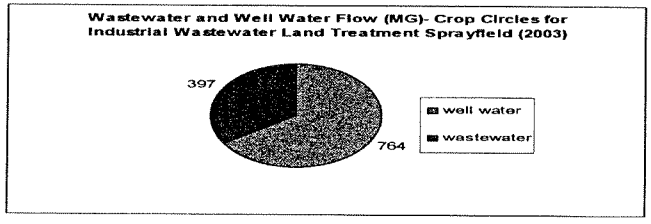
The information contained in the Permittee's comment challenges the potential of their sprayfield operations to impact ground water, and the need for ground water enforcement limits.

In an attempt to better determine the potential of Pasco's land treatment system to impact ground water, Ecology requested and Pasco provided the electronic water and nitrogen EXCEL formatted spreadsheets for each circle, for 2000, 2001, and 2002. Columns were added to estimate the water and nitrogen balance for each circle, and the TDS load to each circle. Crop water requirement values were taken from the Washington Irrigation Guide. Precipitation or irrigation efficiency was not factored into the water budget. TDS load values were based on the average wastewater

3. Well Water Represents the Majority of Water Applied: Wastewater is only a Small Portion

The average amount of reuse water (i.e. food processor wastewater) which has been applied to the crops is only a small portion of the total amount water applied. For example in 2003, reuse water accounted for just 35% of the total amount of water. The other larger percentage of water is well water (groundwater). Chart 1 shows the amount well water vs. wastewater applied to the sprayfield in 2003.

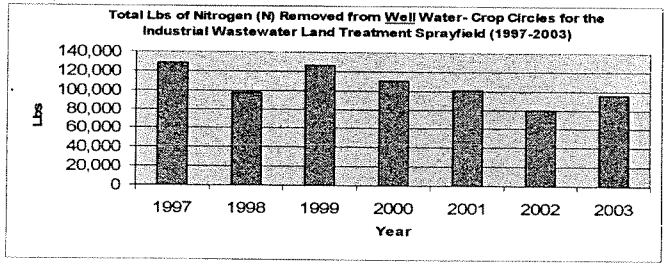
Chart 1



4. The Sprayfield is Removing Nitrogen from the Well (Ground) Water: The Result is Groundwater Treatment.

Similar to nitrates from the wastewater, the sprayfield is effectively removing nitrates (nitrate being the predominate nitrogen species) from the well water (ground water) which represents the majority of the water applied. Nitrates are removed from the well water once applied to the sprayfields as part of the uptake total nitrogen (N) removed. Since 1997, a total of 737,684 lbs of Nitrogen (N) has been removed from well water applied to the sprayfield. Table 2 below shows pounds of nitrogen removed from well water each year from 1997 to 2003.

Table 2



concentration of 988 mg/L (Jan 99-Aug 03). The results of this analysis are presented in Table RE.1, attached to these responses.

The total amount of water applied to each circle sometimes exceeded the crop requirement during each year; positive shaded values. However, the entire sprayfield system was in near balance during each year.

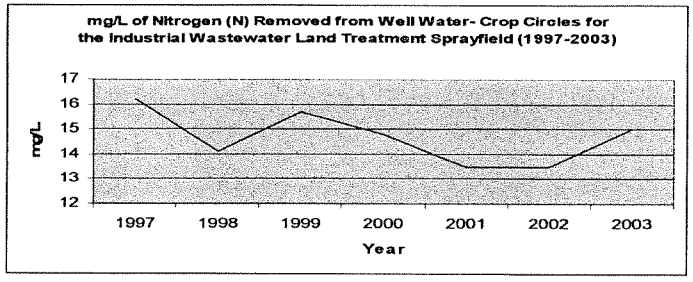
Similarly, more nitrogen was applied to some circles than was removed during each year; positive shaded values. But for two of the three years, the amount of nitrogen applied to the entire sprayfield system was less than what was removed by the crops.

TDS load values to the circles ranged from 9922 to 5840 lbs/acre. These values are generally similar to vegetable and potato processors that operate land treatment systems, and generally exceed the crop requirements. For comparison, the application of a 16:16:16 commercial fertilizer at a rate of 300 lbs/acre, results in the application of approximately 1300 lbs salt/acre.

It is not known what affect these high TDS loads have had on the land treatment system. The annual Farm Circle Reports only report soil conductivity values at specific depths and do not present the data in a trend graph as is done for soil nitrate values. It is also not known if additional water is applied to the fields to leach accumulated salts to control soil salinity levels. As explained in the Fact Sheet, the 1992 Land Application Plan recommended a leaching requirement of 7.6-11.5%.

In addition to requesting the removal of the ground water enforcement limits be removed from the permit based on nitrogen loading to the sprayfield system being less than crop requirements, the Permittee's comment contends that factors outside their control have caused the down gradient ground water quality to be above the ground water criteria. Past/present land use activities north of the site and a discontinuous silt layer have combined to cause nitrate and TDS values in the northerly wells (MW2,3,8) to be high.

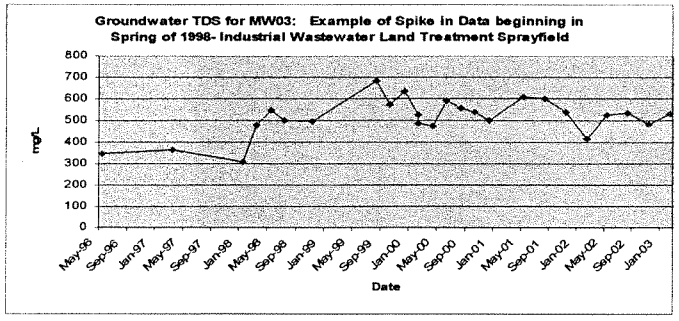
The argument of not being in control of land use and ground water conditions upstream of the discharge site (i.e.,sprayfield site) can be said for any discharge, including a surface water discharge like the city's municipal POTW. Upstream (upgradient) water quality is used to determine water quality-based discharge limits. For surface water discharges, the point of compliance with the limits is generally "end of pipe". For land treatment systems, the point of compliance is generally in the ground water.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
5. The Amount of Nitrogen in mg/L Removed from the Well (Ground) Water is Consistent: A sign that Nitrates in the Well Water is not Increasing. Chart 2 below shows that nitrates removed from the well water is consistent in concentration which demonstrates a trend of non-increase in nitrates within the well water at the sprayfield. Chart 2  **6. Soils Test Data of Nitrate Values in Sprayfield- No Increasing Nitrate Concentrations** The summary within the fact sheet for the draft permit states "There does not appear to be any clear or obvious indications of increasing nitrate concentrations with soil depth at any field." **7. Total Dissolved Solids are Below Ecology's Tolerance Interval and Background Value, and Concentrations are found to be Representative of the Region.** The summary within the fact sheet for the draft permit states "Total dissolved solids values in the downgradient wells have been less then the background value." In reference to the Amended Hydrogeological study report for the Industrial Wastewater Treatment Facility, performed by Landau Associates Oct. 2003, it states that "during the study period (2001-2003) no TDS concentrations exceeded the tolerance interval* of 696 mg/L." The report further say's that "elevated TDS concentrations in groundwater are presented regionally." **8. Total Dissolved Solids: The Draft Permits compares TDS from 1996 and 2003 which Shows an Increase. However, Comparing Levels from 1998 through 2003 Shows Fluctuations but not Increase** With respect to TDS values, the data shown comparing Aug 1996 and Aug 2003 on page 10 of the fact sheet for the draft permit, shows a significant increase per each well. In 1998, the City began performing testing of TDS using a different method at the request of the Dept. of Ecology. The TDS numbers increased using the different testing method but since then have fluctuated iv	It is recognized that the ground water quality in some of the northerly downgradient wells (MW2,8,3) may be influenced by land uses near MW1, and that using MW9 as the background well may not be appropriate. However, no information has been presented that shows northern impacts to the southern monitoring wells (MW4,5,6). There is evidence that supports the Permittee's position that nitrogen loading to the sprayfield site has been below the design of the system and generally less than agronomic rates. In addition, soil nitrogen values do not appear to show high levels or increasing trends with depth. The Permittee provides a lined storage impoundment for the non-growing season, and there are plans to add acreage to the system. Ecology recognizes that the addition of ground water enforcement limits in the new permit is a big change from previous permit conditions, but believes some form of regulatory tool is necessary to insure the protection of the ground water and that the Pemittee is in compliance with the state's water pollution control law and the ground water standards. Based on the information that separates the sprayfield site into a northern and southern area, Ecology proposes to modify the draft permit in a manner that will result in the implementation of regulatory tools for each area. The following changes will be mad: 1. The ground water enforcement limits will be removed from Section S1 of the permit. 2. The following language will be added to Section S7.A.4: "The soil testing results shall include a continuous yearly trend analysis for the soil nitrate and conductivity at each one-foot soil depth as required in Section S2.D, for each circle." 3. The following language change will be made to Section S7.A.8: 8. Ground water trend analysis. A continuous three year trend analysis **of monthly values** for nitrate and TDS at ~~all~~ **each** downgradient wells will be reported, and compared to ~~their respective enforcement limit~~ **the following** values. The analysis shall start with the 2002 well data.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES

somewhat, however, showing no increasing or decreasing trend. Attached is a copy of TDS data for Ground Water for May of 1996 to November of 1998, and also a copy of TDS data for Aug 1999 to Aug 03. A snapshot of MW3, chart 3 below, shows that values for TDS since the spike in spring of 1998 have been in a consistent range well above the numbers previous to the change in lab methodology:

Chart 3



The City strongly feels that the data represented from May of 1996 to Nov of 1998 for TDS in Groundwater at the sprayfield site should not be compared to the data beginning from spring of 1998 to present. And although the numbers for TDS have fluctuated since 1998- making a general statement of increase or decrease does not seem applicable given the data presented since then.

9. Groundwater Concentrations are being Influenced from the North.

Groundwater from the north is influencing the sprayfield groundwater. In reference to the Amended Hydrogeological study report for the Industrial Wastewater Treatment Facility, performed by Landau Associates Oct. 2003, it states on pg 5-2 "The concentration trend is likely impacted by the subsurface silt unit located in the vicinity of MW-1, which perches and structurally controls poor quality groundwater to flow from the north (as observed in MW-1) to the south. Where the silt unit becomes discontinuous or terminates (in the vicinity of Circles VI and VII), the groundwater cascades down to, and impacts, the regional aquifer, as observed in the northern background and downgradient wells." Essentially- groundwater concentrations may go up regarding nitrate and TDS, however, the sprayfield groundwater is being influenced from the North and thus the concentrations are out of the sprayfield operations control.

v

For MW2,3,7, and 8: Total dissolved solids = 673 mg/L
Nitrate (as N) = 33 mg/L

For MW4 and 5: Total dissolved solids = 496 mg/L
Nitrate (as N) = 12 mg/L

All of these permit changes will not result in any increases in testing costs.

At the end of this permit cycle Ecology will evaluate the information presented in all of the annual Farm Circle Reports as required in Section S7. Ecology will also re-calculate the background ground water quality for the northern and southern fields. Based on all of this information additional monitoring and/or reporting requirements, operational controls of the sprayfield site, or ground water enforcement limits may be added to the next permit.

Section G3 of the permit allows Ecology to modify the permit and add conditions or limits during the permit cycle if necessary.

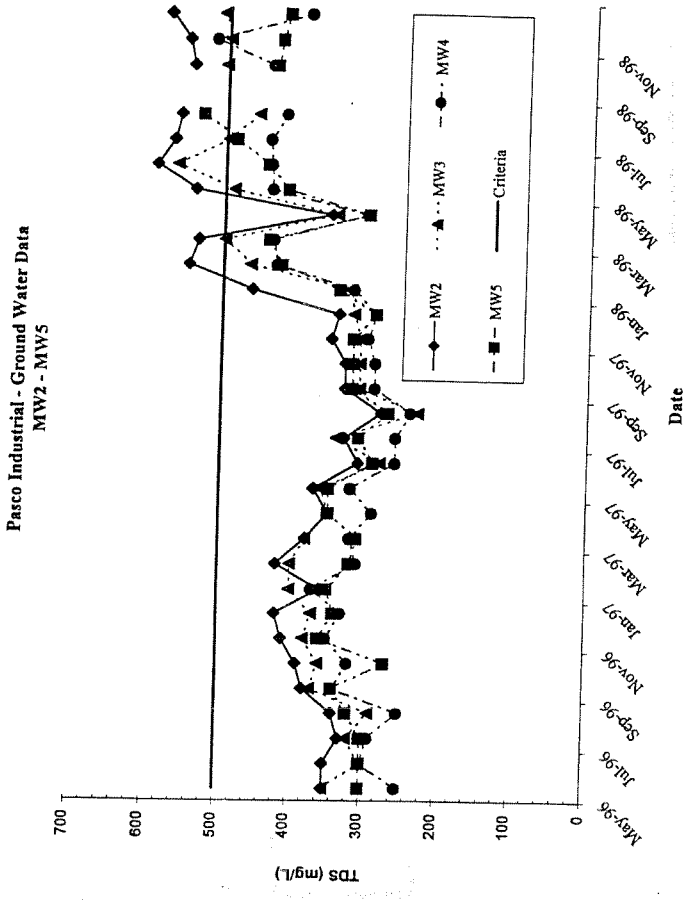
It is strongly recommend that the Permittee consider hiring a consultant to prepare the annual Farm Circle Reports. Not only are they familiar with the reporting requirements that are contained in land treatment permits, but using a consultant would result in the Permittee complying with Section S7 of the permit that requires the reports to be "..reviewed and approved by a soil scientist."

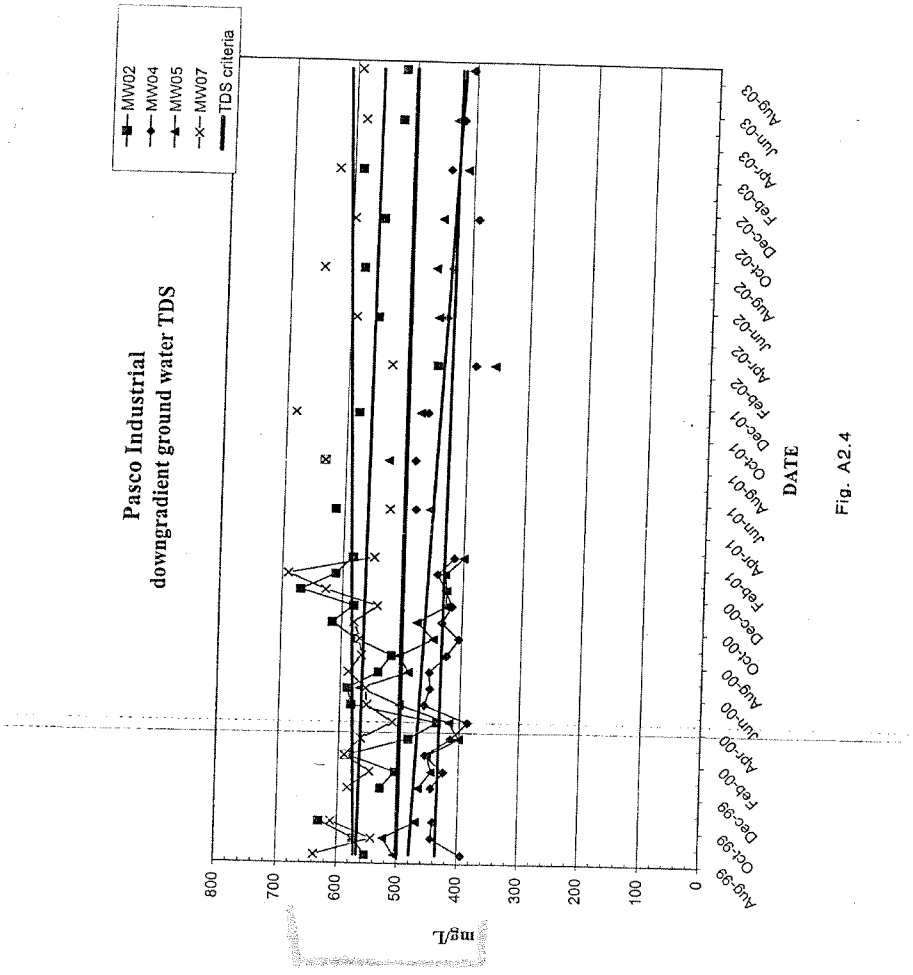
Part #8 of this comment referred to the Fact Sheet and questioned the accuracy of comparing TDS values in the ground water measured in August 1996 with values measured in August 2003, based on a change in the testing procedure for TDS at the request of Ecology.

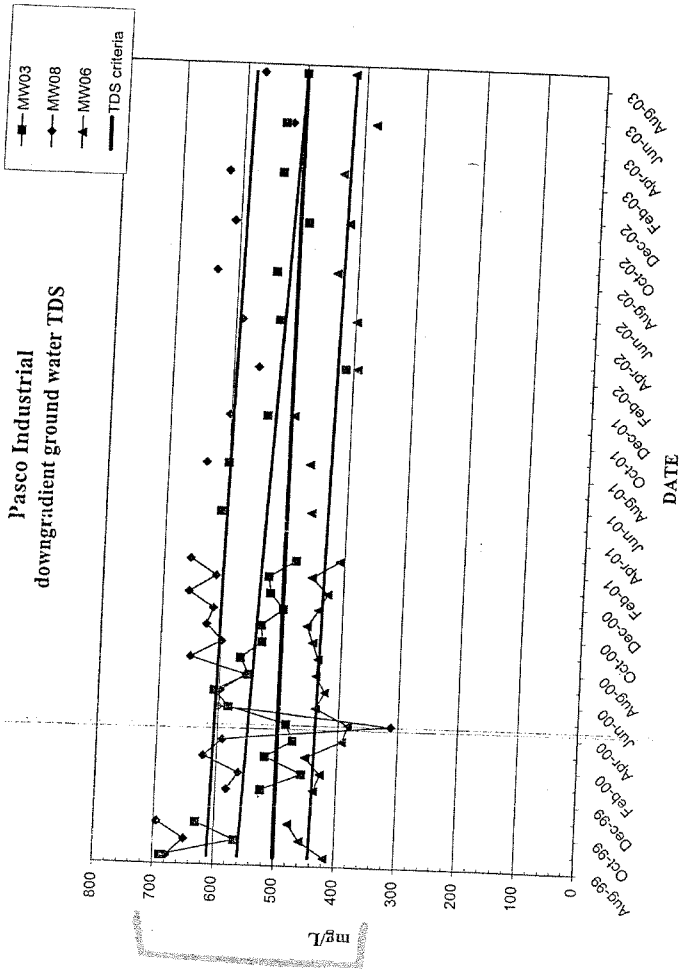
Ecology thanks the Permittee for pointing out the change in TDS test method in 1998. A review of past DMR data does show that August 1998 TDS values for the downgradient wells are generally similar to those in Aug 2003.

The general narrative of Page 10 in the Fact Sheet will not be changed. The following statement will be added to the end of 4th paragraph:

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
We appreciate your attention to this matter, if you have any questions please give me a call at 509-545-3444. Sincerely Robert J. Alberts Robert J. Alberts, P.E. Public Works Director cc: Henry Johnson, Northwest Farm Management Reuel Klempel, Wastewater Treatment Plant Manager Rod Merry, Lead Operator Attachment- TDS Level May of 96 to Nov of 98 (MW2, MW3, MW4, MW5) TDS Level Aug of 99-03 (MW2, MW4, MW5, MW7) TDS Level Aug of 99-03 (MW3, MW6, MW8) vi	"TDS concentrations at all downgradient wells have generally increased since the beginning of sampling in 1996 when use of the sprayfields for wastewater treatment began. August values (mg/L) show this increase: **(NOTE: See Response to Comments for changes)**

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
ATTACHMENT - TDS LEVELS  USE OF NEW TEST METHODOLOGY AS PER ECOLOGY'S DIRECTION	

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
ATTACHMENT CONT..  Fig. A2.4	

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
ATTACHMENT CONT.  Fig. A2.5	

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES

GWMA

RECEIVED
APR - 9 2004
DEPARTMENT OF ECOLOGY

Columbia Basin Ground Water Management Area
449 E. Cedar Blvd., Othello, WA 99344
509-488-2802 ext 108
E-mail: cbgwma@televar.com
Website: www.gwma.org

April 7, 2004

Ms. Cynthia Wall
Eastern Regional Office
Department of Ecology
N. 4601 Monroe, Suite 100
Spokane, WA 99205-1295

RE: City of Pasco Industrial Wastewater Discharge Draft Permit ST5369

Dear Ms. Wall:

It has come to our attention after review of City of Pasco Industrial Wastewater Discharge Draft Permit ST5369 that information in our possession indicates the following view points.

Ecology should not have allowed the discontinued use of Monitoring Well #1 to help describe the potential up-gradient influences on the ground water system below the spray fields. It appears that a nitrate source up gradient and moving south to south-east is impacting the water quality beneath the spray field area.

The Amended Hydrogeological Study Report prepared by Lanau Associates and dated 10/6/2003 states ..."These elevated parameter concentrations may be due to an offsite source, and this source also has potential to impact water quality observations in the northern down gradient monitoring wells"... The report also states ..."Additionally, the presence of the discontinuous silt in the vicinity of MW-1 has the potential to impact the migration of the perched groundwater and infiltrating water from the northern spray fields. As described in previous studies, it is possible that any groundwater accumulating on the silt would follow the slope of this unit to the west, south, or east, depending on the dip of the silt unit and then cascade down to the regional aquifer in the vicinity of circle VI and VII"...

GWMA has the ability to take the localized hydrogeological data from the sprayfield and place it in a regional geologic framework. When we looked outside the boundaries of the

Response to Comment #1: The elimination of monitoring ground water at MW-1 was done in response to a request by the Permittee, which was based on the conclusion reached in the 2000 HG report that MW-1 did not represent ground water conditions hydraulically upgradient of the sprayfield site, and therefore could not provide background ground water quality. Upgradient (background) ground water quality was to be determined from a newly installed well, MW-9.

The 2003 HG report confirmed that MW-9 was completed in the same water bearing unit as was the downgradient wells, and therefore represented upgradient

The hypothesis that off-site sources to the north and the sub-surface geology contribute to high values of nitrate and TDS in the ground water at the downgradient wells in the northern part of the sprayfield site is supported by the 2003 HG report. The Permittee used this information to support their position that downgradient ground water quality is influenced by conditions beyond their control (see previous comments).

It appears that ground water quality information from MW-1, in addition to data from MW-9 and nutrient/water load information presented in the annual Farm Circle Report, are necessary to help explain changes/trends in ground water quality in the northern downgradient wells.

Ecology has decided to modify the draft permit and add MW-1 to the ground water monitoring in Section S2.C of the permit. The sampling frequency will be 4/year; February, May, August, and November. The Table in S2.C will be modified to show these changes; attached.

This will add some minor increase in analytical costs. However, based on the information presented by the Permittee in the 2003 HG report and supporting information provided by the GWMA comment, ground water testing at MW1 will assist in analyzing changes/trends in the downgradient ground water quality.

Response to comment #2: As stated in the Fact Sheet, ground water enforcement limits in the draft permit were based on the background ground water quality, which is defined the Ecology's ground water implementation guidance as the 95% upper tolerance interval with a 95% confidence. The calculation considers the mean and standard deviation of the data set, as well as a tolerance factor, and whether the data is from a parametric or non-parametric data set. Since it is a statistical determination, there is a 5% probability that a value greater than the upper tolerance value will be measured, and a 5% chance that a value will be outside of the data set used for the determination.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
sprayfield area, the regional geology helps explain why the sprayfields can be impacted by poor water quality from the northwest. Because of the complex hydro-geologic setting of the sprayfield area, GWMA is uncomfortable with the current methodology used to define an enforcement limit with the up gradient wells selected to describe background water quality. GWMA suggests that continued monitoring is necessary to further understand the ground water system in the area. MW#1 should be added back into the regular monitoring schedule. As currently written in the permit, the enforcement limit is a static value for the life of the permit (i.e. 5 years). Because there are many potential up gradient and off-site nitrate sources that could affect the down gradient monitoring wells, it is not appropriate to have a static value for the ground water enforcement limit. For instance, the enforcement limit for the northern fields was based on data collected from May 2001 through August 2003 and set at 33.02 mg/l nitrate-n. In the next sampling period in November 2003 the nitrate-n concentration in the up-gradient well was 36.6 mg/l which means the well exceeded its own ground water enforcement limit. Until a better understanding of the contribution of nitrate from the northwest is developed we suggest the current method be used as an early warning value but not as an enforcement limit. Please call if you have any questions. Sincerely, Paul Stoker Executive Director *"Citizens and local government working together for safe drinking water."*	Therefore, the value determined in November 2003 at MW9 being greater than the upper tolerance level (background value) is not unexpected. The nitrate value at MW9 for February 2004 was 31.5 mg/L, below the upper tolerance value of 33.02 mg/L. The variation in ground water quality is recognized by Ecology's guidance in how compliance is determined with an enforcement limit. As explained in the Fact Sheet, two consecutive exceedances of an enforcement limit is needed before non-compliance with an enforcement limit is considered. Until Ecology's ground water implementation guidance is changed, the method used to estimate background ground water and enforcement limits will continue.

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES

Simplot
FOOD GROUP

J.R. SIMPLOT COMPANY / P.O. BOX 3199 PASCO, WA 99302-3199
(509) 544-6700

April 13, 2004

Ms. Cynthia Wall
Eastern Regional Office
Department of Ecology
North 4601 Monroe, Suite 100
Spokane, WA. 99205-1295

Dear Ms. Cynthia Wall,

Upon review of the public draft of State Waste Discharge Permit Number ST 5369, for the City of Pasco, the J. R. Simplot Company has the following comments:

The J. R. Simplot Company was the first customer for the city of Pasco Industrial land application site in 1995. One of the reasons that Simplot chose that site to develop a new, grass-root vegetable processing facility was not only the ability of the city to take and treat our process wastewater, but because we believed that the city's approach to industrial wastewater treatment was the most environmentally reasonable long-term method. There remains today a reluctance for regulators to allow increase surface water loadings from point sources, especially with the TMDL requirements for temperature, nutrients and other components. Land application has been favored because of beneficial use of both the water hydraulic quantity and the nutrients in the wastewater for growing crops.

The Department of Ecology has long held the opinion that for a successful land application site, the following items are recommended: winter hydraulic loading was not appropriate, a nutrient loading balance with crop harvest was essential, and that balancing hydraulic application during the growing season to match crop water requirements would benefit crop growth and minimize soil leaching. To accomplish this, sufficient land is needed for reasonable loading rates. If there is industrial wastewater production during the non-growing (winter) season, the water is held in a pond. It is also important that land use for crop production is reasonably managed.

The city has two major physical components that benefit the Pasco site, first the site has a considerable amount of land (initially approximately 10 circle pivots, about 1150 acres) for the amount of wastewater to be apply, and later, when it became apparent that Simplot plan to utilize the processing facility for year-around processing, a 110 million gallon lined holding pond was constructed to hold the water during the non-growing season. Based on the planned wastewater design loading rates to the site and the

Response to comment: Ecology acknowledges and appreciates the comment received from J.R. Simplot, and recognizes that the Permittee has met all of the general requirements for land treatment systems. The decision to place enforcement limits in the draft permit was based, in part, on the information submitted by the Permittee in the annual Farm Circle Reports. The absence of sprayfield operational and irrigation data (water and salt balances; leaching information) along with trends in the ground water at the downgradient wells portrayed the system as having a potential to impact ground water and the need to have enforcement limits to protect the upgradient ground water quality.

As described previously, Ecology has decided to remove the enforcement limits but add some testing (MW1) and sprayfield reporting (ground water trend analysis). Depending on the data submitted during this five year permit cycle, Ecology may add other requirements or enforcement limits in the next permit to assure protection of the ground water.

Operations and Maintenance Manual, this site would meet AKART requirements that are protective of the environment.

In actual practice, based on the FACT SHEET accompanying the draft permit, the following quotes by Washington Ecology were given: In the summary portion of the FACT SHEET, "wastewater nitrogen and water loads and the total annual wastewater volume have been well below the design capabilities of the treatment system". In addition, for the deep soil test data to 20 feet, there "does not appear to be any clear or obvious indications of increasing nitrate concentrations with soil depth at any field". Also, there appears to be a reasonable balance between crop nitrogen applied and crop uptake. Based on this information, there appears to be no relationship between land application activity and groundwater quality.

The objection to the draft permit is, based on the above information, there should not be an additional new requirement for downgradient point of compliance monitoring well concentration limits for nitrate and total dissolved solids. The site practices Best Management Practices (BMP) for land application, the existing limits based on the Farm Operations and Maintenance Manual has shown to be sufficiently protective of groundwater, therefore additional limits are not required. Please contact me if you have any questions or concerns in regards of this letter.

Sincerely,

Larry Ring
Plant Manager
J.R. Simplot Company

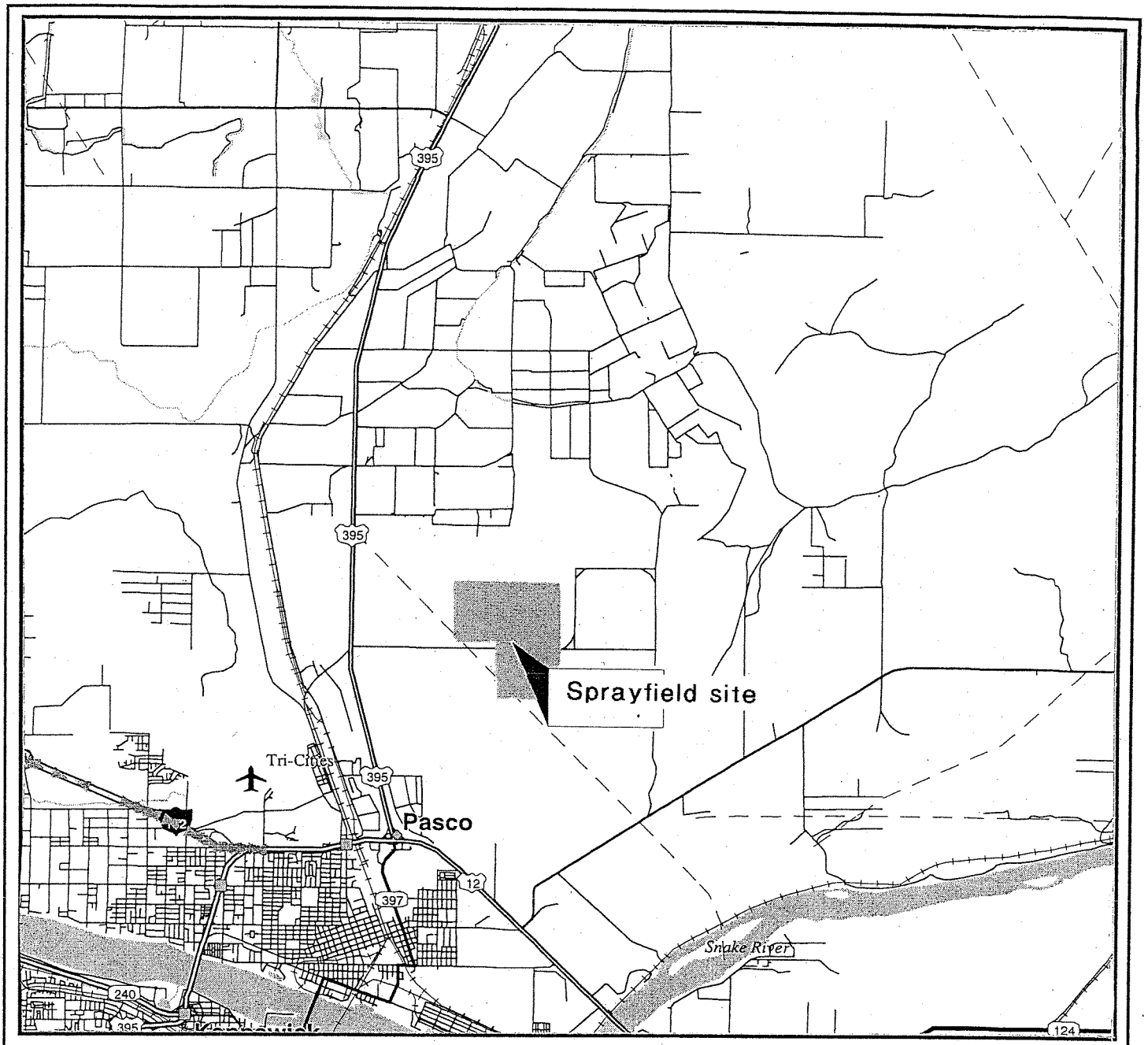
Cc: Henry Hamanishi
J.R. Simplot Research & Development File

lr:rd

COMMENTS TO SWDP 5369, Pasco Industrial	RESPONSES
APR-21-2004 14:35 FROM:PACIFIC NW PROJECT 5097353140 TO:5093293529 P.1/1 1 ***Columbia-Snake River Irrigators Association*** ***INFORMATION MEMORANDUM*** **Distribution—1 Page FAX** **DATE:** **April 18, 2004** **TO:** **Ms. Cynthia Wall, WADOE ERO** **FROM:** **Darryll Olsen, Ph.D., CSRIA Board Rep.** **SUBJECT:** **City of Pasco Industrial Wastewater Discharge Draft Permit ST5369** It is unclear to CSRIA why state regulators would be contemplating further requirements on the City of Pasco's Wastewater Discharge Permit (ST5369). The CSRIA has reviewed portions of the City of Pasco's Discharge Permit, and discussed with Pasco representatives the implications stemming from some of the proposed changes. Our specific interest is the discharge limit affecting groundwater nitrates and TDS, and related monitoring requirements. From our observations in the Northwest, we consider the City of Pasco's spray field operation to be one of the best in the region, and we are aware of the extensive monitoring already taking place by the City. We perceive no value in adding additional conditions to the permit affecting discharge limitations or monitoring—there is no clear reason to do so. The City of Pasco should not be burdened by additional regulations, when they are already operating a "model" program. We see no benefit to Pasco, to the state, to food processors, or to irrigated agriculture by simply adding more conditions to the permit. The permit should remain unchanged regarding discharge limits and monitoring requirements. If you intend to make changes here, then please provide us with a written justification for doing so. cc: City of Pasco ***3030 W. Clearwater, Suite 205-A, Kennewick, WA 99336*** ***509-783-1623, FAX 509-735-3140*** ***CSRIA Information Memorandum***	Response to comment: The basis and rationale for placing ground water enforcement limits in the proposed permit are given in the Fact Sheet. Ecology's ground water implementation guidance was followed for issuing discharge permits to facilities that have a potential to impact ground water. This guidance was written to insure the consistent application of the ground water quality standards to all activities that have a potential to impact ground water. Based on the ground water and sprayfield information submitted by the Permittee, Ecology determined that the land treatment system had a potential to impact ground water. As explained previously, Ecology has agreed to withdraw the enforcement limits for this permit cycle, but may require them in the next permit depending on the ground water and sprayfield information submitted by the Permittee during this permit cycle. The conditions and limits placed in the draft permit were meant, in part, to insure that the facility is operated in a manner that is protective of the existing and future beneficial uses of the ground water as required by the ground water regulation, and for the Permittee to comply with the state's water pollution law to maintain the highest possible standards to insure the purity of all waters of the state; all of which was explained in the permit's Fact Sheet.

Pasco Industrial – Approximate Permit Actions Timeline

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2004				Issue Permit Farm Circle Report								
2005				Farm Circle Report					Updated O&M Manual			
2006				Farm Circle Report		Revised Farm Management Plan						
2007				Farm Circle Report				Submit Permit Application				
2008				Permit Expires Farm Circle Report								

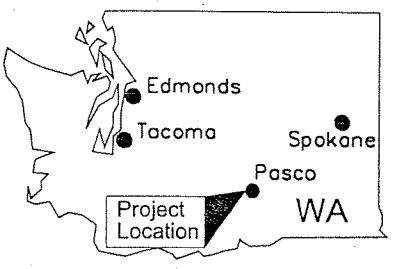


Source: 1998 Delorme Street Atlas

0 2 Mi 4 Mi

Scale in Miles

N

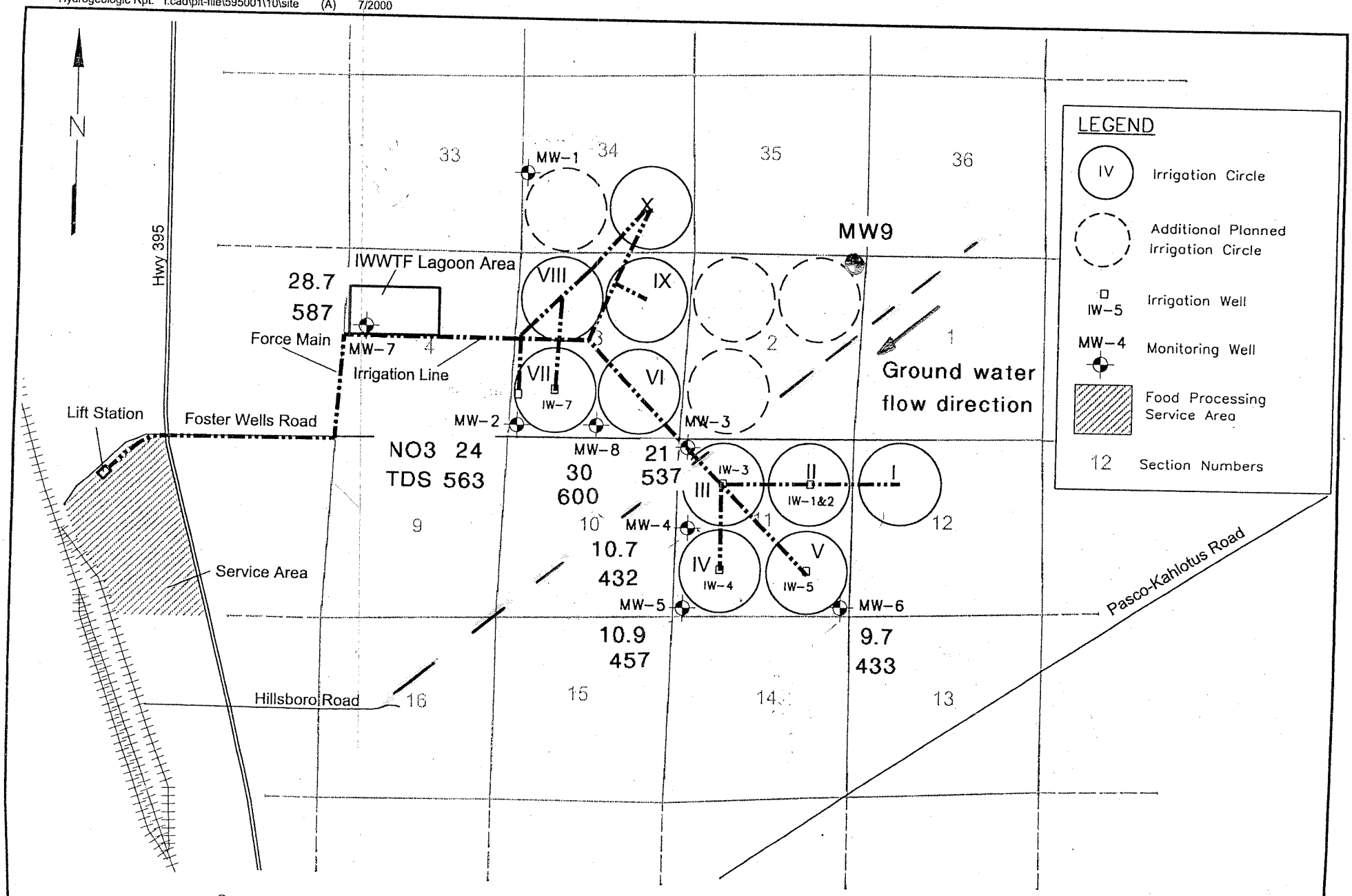


City of Pasco

Industrial Wastewater Facility

Vicinity Map

Figure 1



City of Pasco

Industrial Wastewater Facility

Site Map and Well Location

Figure 2

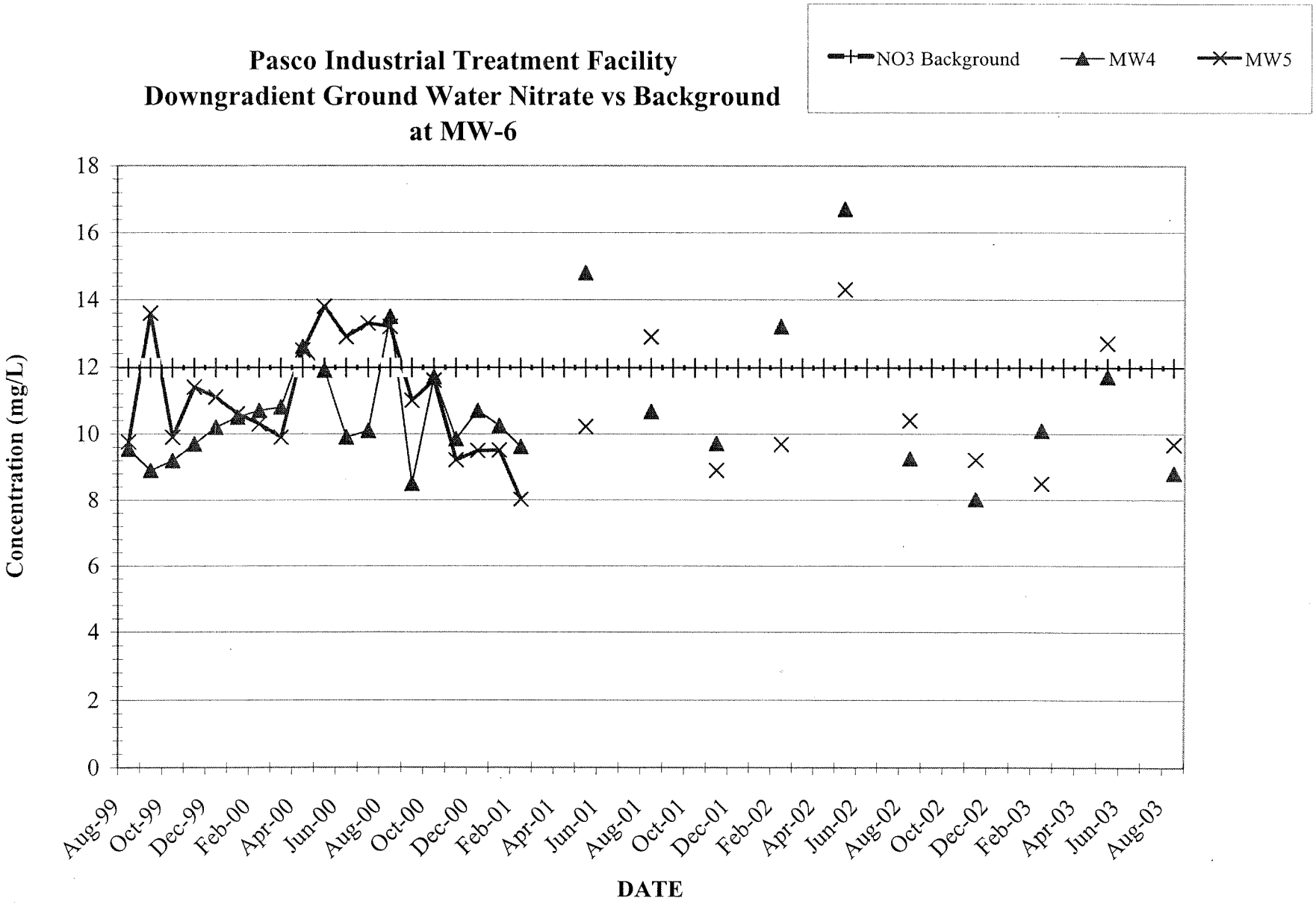

Pasco Industrial Treatment Facility
Downgradient Ground Water Nitrate vs Background
at MW-6
NO3 Background
MW4
MW5
Concentration (mg/L)
18
16
14
12
10
8
6
4
2
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Figure 3

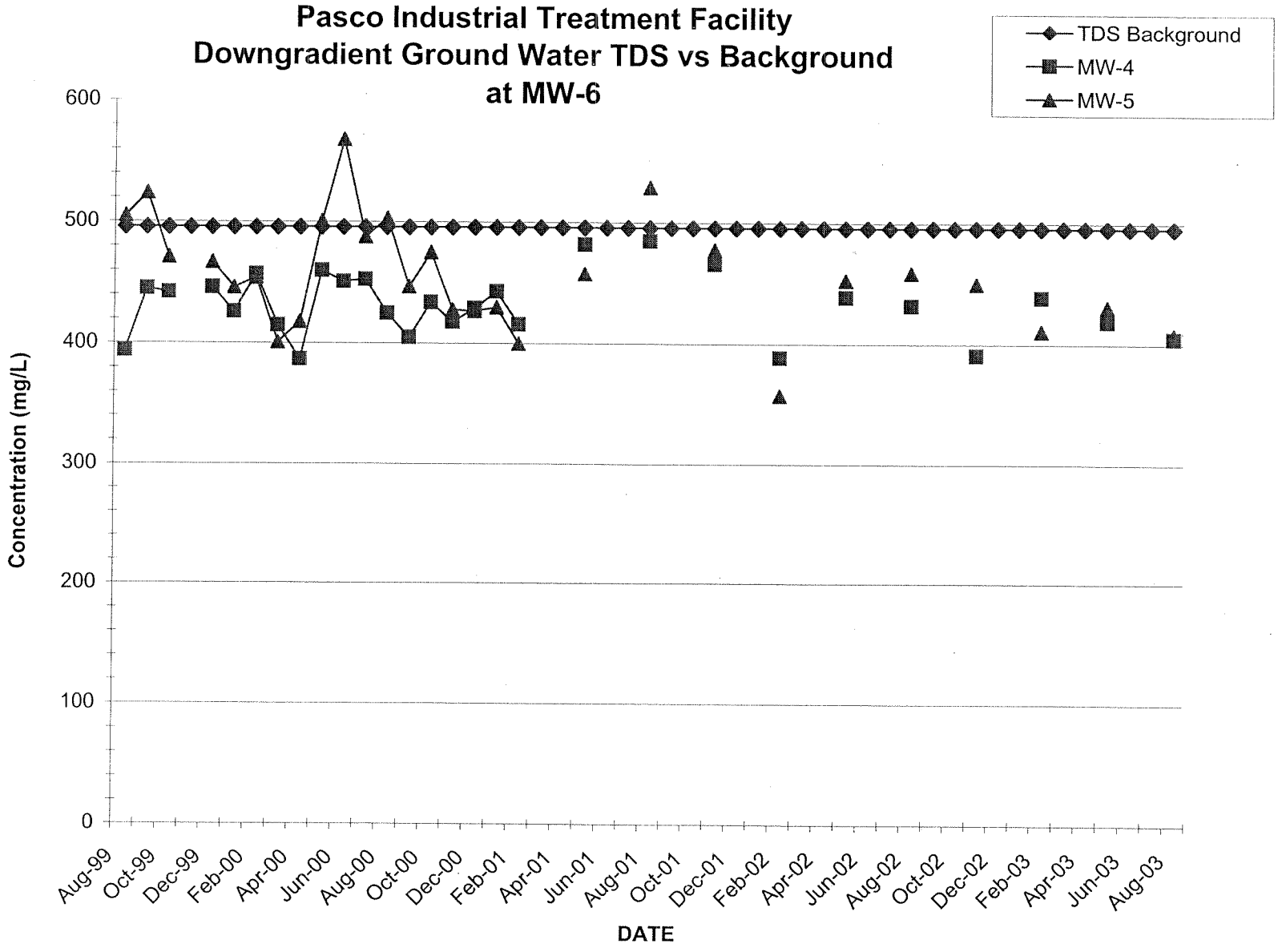

Pasco Industrial Treatment Facility
Downgradient Ground Water TDS vs Background
at MW-6
TDS Background
MW-4
MW-5
Concentration (mg/L)
600
500
400
300
200
100
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Figure 4

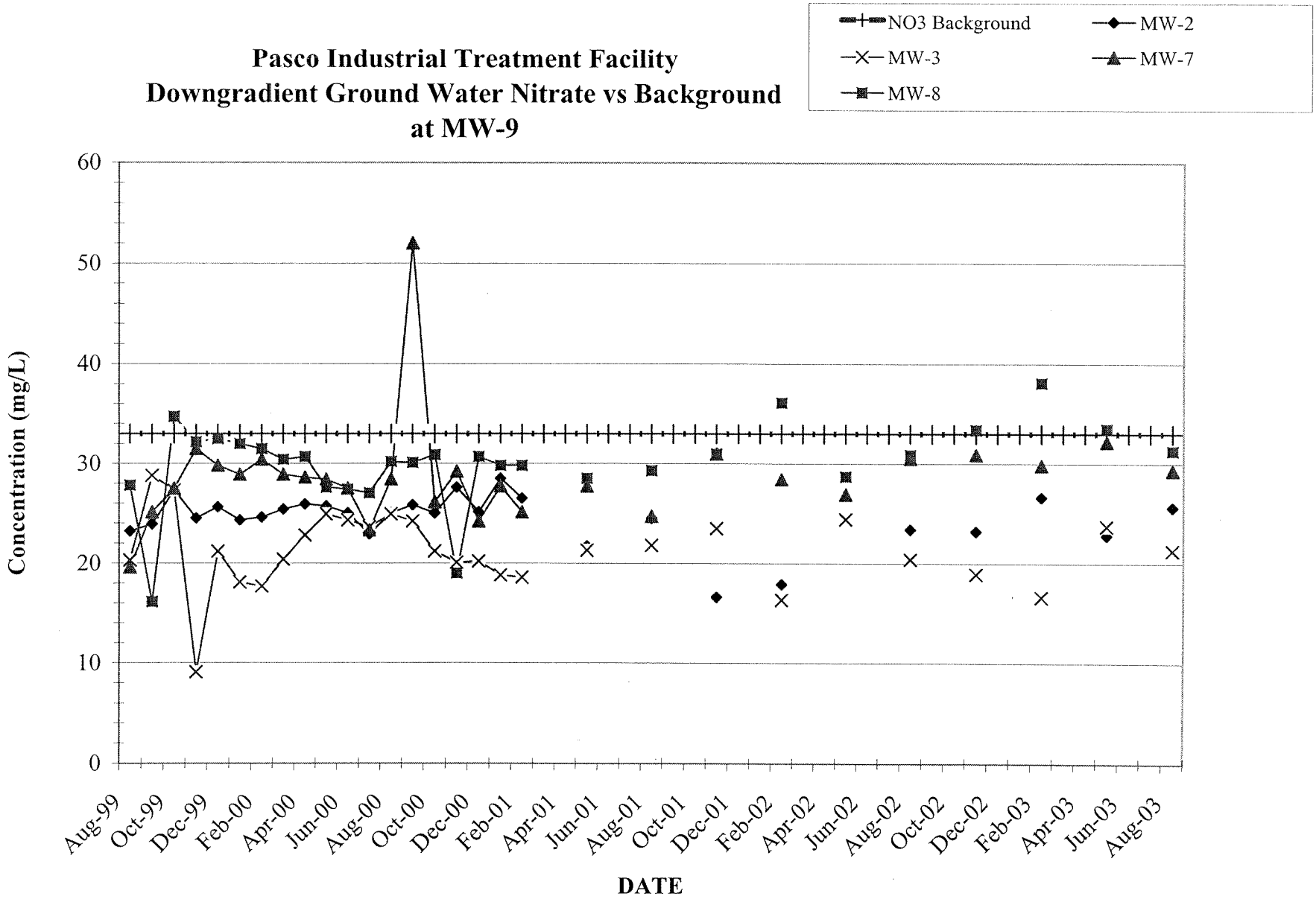

Pasco Industrial Treatment Facility
Downgradient Ground Water Nitrate vs Background
at MW-9
NO3 Background
MW-2
MW-3
MW-7
MW-8
Concentration (mg/L)
60
50
40
30
20
10
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Figure 5

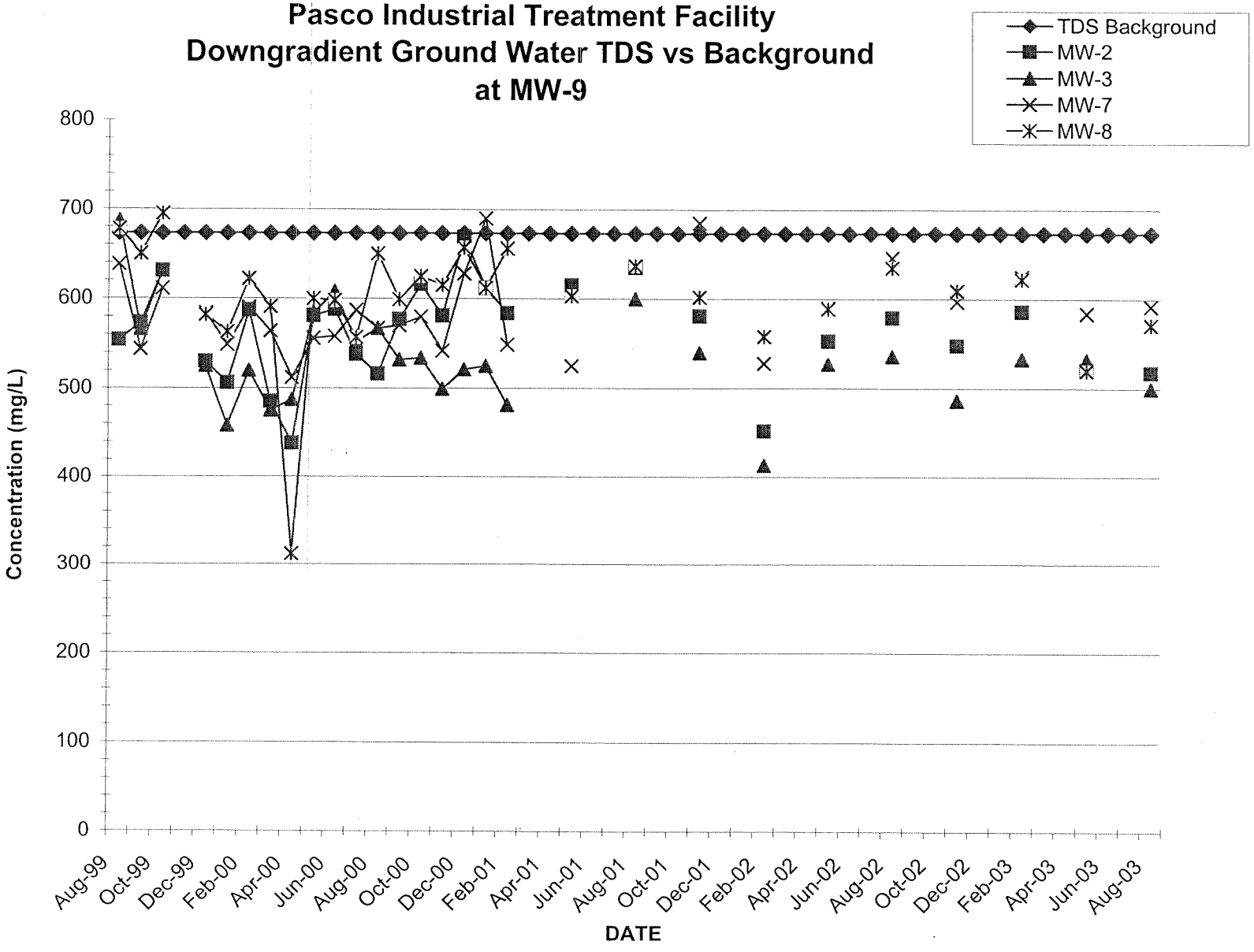

Pasco Industrial Treatment Facility
Downgradient Ground Water TDS vs Background
at MW-9
TDS Background
MW-2
MW-3
MW-7
MW-8
Concentration (mg/L)
800
700
600
500
400
300
200
100
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Figure 6

APPENDIX 1

PASCO INDUSTRIAL DMR SUMMARY (AUG 99 - AUG 2003

	Raw Wastewater							
	Flow							
	AVERAGE		MAXIMUM		Mon. TOTAL		ANNUAL TOTAL	
DATE	MGD	QL	MGD	QL	MG	QL	MG	QL
Jan-99	0.913		1.295		28.299		28.299	
Feb-99	0.906		1.326		25.366		53.665	
Mar-99	0.519		1.145		16.091		69.756	
Apr-99	0.523		0.881		15.695		85.451	
May-99	0.773		1.202		23.948		109.399	
Jun-99	0.504		0.86		15.113		124.512	
Jul-99	0.827		1.928		25.629		150.141	
Aug-99	2.678		3.474		83.022		233.163	
Sep-99	3.032		4.092		90.966		324.129	
Oct-99	2.71		4.064		84.003		408.132	
Nov-99	0.928		1.406		27.847		435.979	
Dec-99	0.701		1.212		21.736		457.715	
Jan-00	0.59		0.977		18.289		18.289	
Feb-00	0.789		1.23		22.869		41.158	
Mar-00	0.723		1.042		21.734		62.892	
Apr-00	0.351		0.639		10.788		73.68	
May-00	0.291		0.45		9.046		82.726	
Jun-00	0.219		0.57		6.498		89.224	
Jul-00	1.034		2.648		35.083		76.241	
Aug-00	2.845		3.432		89.072		213.379	
Sep-00	2.543		3.125		76.293		289.672	
Oct-00	1.878		3.111		56.328		346	
Nov-00	0.627		1.069		19.09		365.09	
Dec-00	0.518		1.068		15.058		380.148	
Jan-01	0.811		1.23		24.317		24.317	
Feb-01	1.077		1.258		30.164		55.633	
Mar-01	0.804		1.15		24.92		80.553	
Apr-01	0.539		0.924		16.18		16.18	
May-01	0.601		0.782		18.618		115.351	
Jun-01	0.459		0.93		13.779		129.13	
Jul-01	0.746		2.215		23.114		152.244	
Aug-01	2.695		3.214		83.56		235.8	
Sep-01	2.658		2.918		79.73		315.534	
Oct-01	1.562		2.882		48.428		363.962	
Nov-01	0.765		1.078		22.95		407.056	
Dec-01	0.529		0.918		16.386		423.442	
Jan-02	0.603		1.046		18.7		18.7	
Feb-02	0.79		1.06		22.107		40.814	
Mar-02	0.751		1.019		23.269		64.083	
Apr-02	0.784		1.07		23.513		88.343	
May-02	0.495		0.873		14.849		103.192	
Jun-02	0.248		0.323		7.443		110.635	
Jul-02	0.782		2.519		23.446		134.081	
Aug-02	2.695		3.002		83.542		217623	
Sep-02	2.992		3.269		89.751		307.374	
Oct-02	1.847		3.228		57.261		364.635	
Nov-02	0.786		1.264		23.57		388.205	
Dec-02	0.761		1.135		23.586		411.79	
Jan-03	0.903		1.166		28.007		28.007	
Feb-03	0.785		1.09		21.975		49.982	
Mar-03	0.63		0.806		19.544		69.526	
Apr-03	0.54		0.76		16.203		85.729	
May-03	0.528		0.761		16.373		102.102	
Jun-03	0.436		0.867		13.075		115.177	
Jul-03	1.389		2.719		43.056		158.233	
Aug-03	2.858		3.372		88.586		246.8	

AVG	1.1119821	1.6623929	33.890446
MAX	3.032	4.092	90.966
MIN	0.219	0.323	6.498

PASCO INDUSTRIAL DMR SUMMARY (AUG 99 - AUG 2003)

Irrigation Wastewater

	Flow								TKN								NO3+NO2 (as N)								Total Nitrogen (as N)							
	AVERAGE		MAXIMUM		Tot. Monthly		ANNUAL TOTAL		AVERAGE		MAXIMUM		Tot. Monthly		ANNUAL TOTAL		AVERAGE		MAXIMUM		Tot. Monthly		ANNUAL TOTAL		AVERAGE		MAXIMUM		Tot. Monthly		ANNUAL TOTAL	
DATE	MGD	QL	MGD	QL	MG	QL	MG	QL	lbs/day	QL	lbs/day	QL	lbs	QL	lbs	QL	lbs/day	QL	lbs/day	QL	lbs	QL	lbs	QL	lbs/day	QL	lbs/day	QL	lbs	QL	lbs	QL
Jan-99		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Feb-99																																
Mar-99	0.936		2.941		29.009		29.009		374		1501		11590		11590		8		25		242		242		382		1524		11832		11832	
Apr-99	0.783		3.024		23.488		52.497		377		2089		11296		11786		6.5		25.2		196		438		383		2098		11492		23324	
May-99	1.372		4.421		42.517		95.014		1149		5022		35622		47408		11.4		36.9		355		793		1161		5044		35977		59301	
Jun-99	1.296		4.208		38.878		133.892		590		2537		18293		65701		10.5		35.1		324		1117		601		2562		18617		77918	
Jul-99	0.957		2.442		29.668		163.56		295		742		9146		74847		8		20.4		247		1364		303		761		9394		87312	
Aug-99	2.716		3.952		84.201		247.761		1715.1		3083.3		53167		128014		22.7		33		702.2		2066.2		1737.7		3112.7		53869		141181	
Sep-99	2.973		3.956		89.184		336.945		1834		2616		56852		184866		24		33		743.8		2810		1858		2649		57595		198776	
Oct-99	2.734		5.075		84.745		421.69		1630		3162		50537		235403		22.8		42.3		706.8		3516.8		1653		3204		51244		250020	
Nov-99	0.944		1.736		28.311		450.001		723		1469		22411		257814		7.6		14.5		236.1		3752.9		731		1483		22647		272667	
Dec-99		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Jan-00		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Feb-00		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Mar-00	0.282		2.861		8.747		8.747		61.1		721		1893.8		1893.8		4		48		125.4		125.4		65.1		768		2019.2		2019.2	
Apr-00	1.072		2.99		31.085		39.832		459.4		1460.5		13782		15676		32		87.8		959		1084		475.9		1548.4		14276		16295	
May-00	1.201		2.895		33.621		73.453		411		1032		12740		28416		21		96		655		1739		432		1056		13369		29691	
Jun-00	0.766		2.38		22.989		96.442		404		1171.1		9292		37708		13.2		33.9		304		2043		417.2		1190.7		9596		39287	
Jul-00	1.442		3.229		44.701		141.146		476		972		14747		52455		12		27		373		2416		488		999		15120		54407	
Aug-00	2.893		4.115		89.684		230.83		2665		4461		82612		120320		24		34		748		2791		2689		4496		83360		137767	
Sep-00	2.703		3.754		81.081		311.911		2018.9		3981.2		60568		195635		147.2		388.2		4415		7579		2166.1		4011.8		64983		203214	
Oct-00	1.943		4.052		58.28		370.191		980		2242		30381		211269		26		68		804		8010		1006		2266		31185		234400	
Nov-00	0.513		1.781		15.396		385.59		243		911		7285		233301		4		15		125		8508		247		925		7410		241810	
Dec-00		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Jan-01		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Feb-01		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Mar-01	0.781		1.984		21.084		21.084		693.1		2829.5		18715		18715		6.5		16.5		175.8		175.8		699.7		2846		18890.8		18890.8	
Apr-01	0.96		2.876		28.8		49.884		6075		26353		182237		200952		8		24		240		416		6083		26368		182477		201368	
May-01	1.282		3.506		38.769		88.653		1034.8		3801.2		31036.6		231989		10.688		29.24		323.3		739.3		1045.4		3830.4		31359.9		232728	
Jun-01	1.394		3.586		41.83		130.483		90.7		130		2630.9		33401.7		1		1		29		116		91.7		131		2659.9		33517.7	
Jul-01	0.925		2.635		28.674		159.157		674.251		2307.5		20901.8		281899		7.7		21.976		239.1		1315.1		681.966		2329.4		21140.9		283214	
Aug-01	2.88		3.87		89.3		241.5		89.7		105		2781.4		38440		1		1		31		178		90.7		106		282.4		38618	
Sep-01	2.996		3.714		89.867		331.411		103.4		115		3102.5		41542.6		1		1		30		208		104.4		116		3132.5		41750.6	
Oct-01	1.7		3.604		52.695		384.106		1160.6		3456.6		35979.5		462196		14.2		30.1		439.5		3248.9		1174.8		3486.7		36419		464916	
Nov-01	0.824		2.419		24.716		408.822		11.5		2582.3		22940.1		485136		728		59.2		356		3604.9		578		2602.5		21840.4		486756	
Dec-01		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Jan-02		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Feb-02		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Mar-02	0.66		2.778		20.446		20.446		264		2089.8		8185.4		8185.4		29		229.1		897.7		897.7		293		2318.9		9083.1		9083.1	
Apr-02	1.563		4.214		46.901		67.347		681.1		2473.6		19753.3		27938.7		30.7		134.1		889.2		1786.9		711.8		2500		20642.5		29725.6	
May-02	0.946		2.773		29.754		97.101		285.4		979.2		8848.4		36787.1		9.2		41.5		286.3		2073.2		294.7		997.6		9134.6		38860.2	
Jun-02	0.819		2.819		24.58		121.681		253.9		973.3		7362.1		44149		75.7		420		2194.2		4267.4		329.5		996.8		9556.3		48417	
Jul-02	0.87		2.696		26.114		147.795		181.6		452.8		6102		50251		52.9		349.4		1578		5845		234.5		627.8		7682		56097	
Aug-02	2.693		3.69		83.472		231267		1532		2188		49015		99266		22		31		696		6541		1553		2213		49711		105808	
Sep-02	3.006		3.663		90.169		321.436		1153.7		1775.9		34611.1		133877		25.1		30.5		752		7293		1178.8		1804.6		35363.1		141171	
Oct-02	1.866		4.251		57.835		379.271		672		1552		19486.7		150100		16.1		35.5		466.1		7703.6		688		1578.5		19952.7		157805	
Nov-02	0.769		2.127		23.056		402.327		657		2005		20357		170457		6.2		17.7		192.3		7896.3		663		2022		20549		178354	
Dec-02		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Jan-03		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Feb-03		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C		C
Mar-03	1.016		2.562		15.238		15.238		437		671.3		6557.6		6557.6		8.5		13		127.1		127.1		446		684.3		6684.7		6684.7	
Apr-03	1.84		3.07		40.576		55.814		989		1826.2		21750.8		28308.4		15.4		25.6		338.4		465.5		1009		1850.3		22089.2		28773.9	
May-03	1.336		2.95		33.4		89.224		766.1		1737.8		19917.5		48225.9		10.7		24.6		278.6		744.1		776.8		1755.9		20196.1		48970	
Jun-03	1.7		2.76		40.832		130.056		936.5		1749.7		22476.9		70702.8		14.19		23		340.5		1084.6		950.7		1768		22817.5		71787.5	
Jul-03	1.661		3.427		46.516		176.572		982.4		2592.3		27506.4		98209.2		13.9		28.6		387.9		1472		996.2		2620.9		27894.4		99681.9	
Aug-03	2.745		4.4		84.9		261.478		1910		3283.6		61126		159335		22.152		36.7		708		2180.6		1932		3320		61834		161516	
AVG	1.54186		3.24252		45.5978		5689.44		905.72		2552.47		27514.2		115255		36.5412		63.9909		577.555		2637.51		938.159		2585.08		27985.2		120612	
MAX	3.006		5.075		90.169		231267		6075		26353		182237		485136		728		420		4415		8508		6083		26368		182477		486756	
MIN	0.282		1.736		8.747		8.747		11.5		105		1893.8		1893.8		1		1		29		116		65.1		106		282.4		2019.2	

C = No Discharge

Irrigation Wastewater

	BOD				COD				pH				Conductivity				TDS			
	AVERAGE		MAXIMUM		AVERAGE		MAXIMUM		MINIMUM		MAXIMUM		AVERAGE		MAXIMUM		AVERAGE		MAXIMUM	
DATE	lbs/day	QL	lbs/day	QL	mg/L	QL	mg/L	QL	s.u.	QL	s.u.	QL	umhos/cm	QL	umhos/cm	QL	mg/L	QL	mg/L	QL
Jan-99		C		C		C		C		C		C		C		C		C		C
Feb-99																				
Mar-99	1793		6443		1040		1750		5.2		7.7		1040		1750		633		732	
Apr-99	3269		19890		678		1190		5.3		7.6		862		968		707		883	
May-99	6295		24435		1335		1720		4.5		7.8		1335		1720		813		960	
Jun-99	272		325		706		940		7.1		7.8		777		781		651		820	
Jul-99	5727		22057		888		938		3.8		6.5		661		747		691		846	
Aug-99	50908		107712		5180		6370		3.4		5.18		667		707		1065		1920	
Sep-99	57772		98007		4395		4660		3.77		4.63		603.5		721		1135		1520	
Oct-99	52728		99515		4375		5270		4.31		5.6		628		680		1450		1860	
Nov-99	5903		11543		2353		3480		3.9		7.3		2353		3480		642		1040	
Dec-99		C		C		C		C		C		C		C		C		C		C
Jan-00		C		C		C		C		C		C		C		C		C		C
Feb-00		C		C		C		C		C		C		C		C		C		C
Mar-00	2080		21093		64488		64488		6.58		7		928		928		1040		1040	
Apr-00	19878		64760		596341		660829		5.95		7.49		798		928		784		1040	
May-00	2783		9928		555		800		6.5		7.8		888		908		624		674	
Jun-00	1085.6		3811		539		740		7.2		7.6		810.9		999		611.5		768	
Jul-00	6656		17881		320		320		3.9		6.9		721		721		580		580	
Aug-00	59251		97326		7695		8240		3.8		4.7		686		686		870		1120	
Sep-00	40864.6		83268		4780		6460		4.3		5.4		596.5		646		652.5		683	
Oct-00	35015		82457		4295		4440		4.4		5.4		618		636		533		534	
Nov-00	4197		23252		2975		4280		5.9		7.5		636		680		562		694	
Dec-00		C		C		C		C		C		C		C		C		C		C
Jan-01		C		C		C		C		C		C		C		C		C		C
Feb-01		C		C		C		C		C		C		C		C		C		C
Mar-01	6609.2		16712		3020		3620		4.6		6.4		829		900		843		1100	
Apr-01	6900		24482		1555		2360		6.2		6.9		505		958		3083		5450	
May-01	8714.8		26725.4		1260		1300		6.441		7.3		835.667		883		906		1270	
Jun-01	4791		14236		1330		1540		6		7.7		818.5		936		921		1100	
Jul-01	9325.5		47182.3		289090		1076318		4		7.6		706.455		765		590.727		648	
Aug-01	64091		95069		5320		5610		4.3		6.7		620		650		611		687	
Sep-01	75702		105934			S	5440		4.5		4.8			S	653		595		788	
Oct-01	29904.1		79231.2		2195.5		4190		4.6		5.4		568		632		758.5		795	
Nov-01	740		18721.9		907.9		2560		4.2		5.5		2070		565		559.5		616	
Dec-01		C		C		C		C		C		C		C		C		C		C
Jan-02		C		C		C		C		C		C		C		C		C		C
Feb-02		C		C		C		C		C		C		C		C		C		C
Mar-02	3482.8		25786.6		3470		3470		4		5.5		679		679		629		629	
Apr-02	8884.6		21438.3		3470		4390		6		7.3		834		870		904.5		936	
May-02	4352		17421.6		1435		2200		6.5		7.2		956		1030		762.5		830	
Jun-02	502.6		1950.6		360		400		7.2		7.7		1127.5		1145		786.5		887	
Jul-02	8988.9		42296.6		3117.5		4510		5.4		7.4		942		974		1527.5		2215	
Aug-02	53384.1		67057.9		2747		5225		4.3		5		731		759		3335		3870	
Sep-02	68466.2		88776.6		6570		6840		4.4		5		721		750		2960		3120	
Oct-02	39727.8		103027		3970		5470		4.6		5.2		812.5		996		665		787	
Nov-02	8727		26928		3110		3800		4.3		4.5		786.5		787		806		1120	
Dec-02		C		C		C		C		C		C		C		C		C		C
Jan-03		C		C		C		C		C		C		C		C		C		C
Feb-03		C		C		C		C		C		C		C		C		C		C
Mar-03	11819		18149.5		4680		4680		4.4		4.8		1030		1030		1170		1170	
Apr-03	14419		32285.2		2165		3100		5.6		6.6		821.5		830		790.5		842	
May-03	5970.3		16434.8		1320		1440		6.2		6.8		1045		1240		773		820	
Jun-03	200.9		392		1010		1050		6.5		7.5		1220		1380		645		667	
Jul-03	25334		83743		5795		7760		4.2		5.6		661		820		1625		2150	
Aug-03	3432.8		3765		8415		8510		4.2		4.9		891.5		894		1205		1250	

AVG	19546	42177	25835	46255			874	948	988	1225
MAX	75702	107712	596341	1076318	7.2	7.8	2353	3480	3335	5450
MIN	200.9	325	320	320	3.4	4.5	505	565	533	534

C = No Discharge

PASCO INDUSTRIAL DMR SUMMARY (AUG 99 - AUG 2003)

Irrigation Wastewater

	Tot. SODIUM		Tot. BORON		Tot. CALCIUM		Tot. MAGNESIUM		Tot. POTASSIUM		SO4-S		CHLORIDE		BICARB		T-PO4 (as P)	
DATE	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL
Jan-99		C		C		C		C		C		C		C		C		C
Feb-99																		
Mar-99																		
Apr-99	28.3		0.014	F	26.2		10.7		125		56.6		27.3		0		17.3	
May-99																		
Jun-99																		
Jul-99																		
Aug-99																		
Sep-99																		
Oct-99	26.1		0.08		21.8		13.9		112		21.9		27.1			B	20.3	
Nov-99																		
Dec-99																		
Jan-00																		
Feb-00																		
Mar-00																		
Apr-00																		
May-00																		
Jun-00	46.2		0.101		21.9		11.3		128		34.7		35.4		298		22.7	
Jul-00																		
Aug-00																		
Sep-00																		
Oct-00	31.1		0.069		23.3		22.3		92		21.7		36.1		0.2		24.7	
Nov-00																		
Dec-00																		
Jan-01																		
Feb-01																		
Mar-01																		
Apr-01																		
May-01																		
Jun-01	60.7		0.059		30.4		13.7		172		29.2		40.4		296		42.6	
Jul-01																		
Aug-01																		
Sep-01																		
Oct-01	26.4		0.047		23.7		15.3		106		30.6		26.7		2	F	33.3	
Nov-01																		
Dec-01																		
Jan-02																		
Feb-02																		
Mar-02																		
Apr-02																		
May-02																		
Jun-02	70.3		0.058		28.1		10.7		178		33.2		44.5		435		52.9	
Jul-02																		
Aug-02																		
Sep-02																		
Oct-02	35.8		0.048		33.8		21.2		152		37.3		31.9		2	F	29.8	
Nov-02																		
Dec-02																		
Jan-03																		
Feb-03																		
Mar-03																		
Apr-03																		
May-03																		
Jun-03	65.1		0.08		26.5		15.5		192		36.9		43		268		20.9	
Jul-03																		
Aug-03																		
AVG	43.3		0.06		26.2		15.0		140		33.6		34.7		163		29.4	
MAX	70.3		0.101		33.8		22.3		192		56.6		44.5		435		52.9	
MIN	26.1		0.047		21.8		10.7		92		21.7		26.7		0		17.3	

C = No Discharge
B = Below Detection/No Detect
F = Less Than

PASCO INDUSTRIAL GROUNDWATER SUMMARY (MW2 - MW9; AUG 99 - AUG 2003)

	MW02		MW02		MW03		MW03		MW04		MW04		MW05		MW05	
	NO3-N		TDS		NO3-N		TDS		NO3-N		TDS		NO3-N		TDS	
	SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE	
DATE	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL
Aug-99	23.2		554		20.3		687		9.54		394		9.76		505	
Sep-99	23.9		573		28.8		566		8.9		445		13.6		524	
Oct-99	27.3		631		27.3		631		9.2		442		9.9		471	
Nov-99	24.5			E	9.1			E	9.7			E	11.4			E
Dec-99	25.6		530		21.2		525		10.2		446		11.1		467	
Jan-00	24.3		506		18.1		458		10.5		426		10.6		446	
Feb-00	24.6		587		17.7		520		10.7		457		10.3		454	
Mar-00	25.4		485		20.4		475		10.8		415		9.9		401	
Apr-00	25.9		438		22.8		487		12.6		387		12.5		418	
May-00	25.7		581		24.9		584		11.9		460		13.8		501	
Jun-00	25		588		24.3		608		9.9		451		12.9		568	
Jul-00	22.9		538		23.6		552		10.1		453		13.3		488	
Aug-00	25		516		24.9		567		13.5		425		13.2		503	
Sep-00	25.8		577		24.2		532		8.5		405		11		447	
Oct-00	25		616		21.2		534		11.7		434		11.6		475	
Nov-00	27.6		581		20.1		499		9.85		418		9.22		428	
Dec-00	25.1		669		20.2		521		10.7		429		9.5		427	
Jan-01	28.5		612		18.8		525		10.25		443		9.52		430	
Feb-01	26.5		584		18.6		481		9.62		416		8.02		400	
Mar-01		6		6		6		6		6		6		6		6
Apr-01																
May-01	21.7		615		21.3		609		14.8		482		10.22		458	
Jun-01																
Jul-01																
Aug-01	24.5		635		21.8		600		10.67		485		12.9		529	
Sep-01																
Oct-01																
Nov-01	16.6		581		23.5		540		9.72		466		8.91		478	
Dec-01																
Jan-02																
Feb-02	17.9		452		16.3		413		13.2		389		9.69		357	
Mar-02																
Apr-02																
May-02	24.4		553		24.4		527		16.7		439		14.3		453	
Jun-02																
Jul-02																
Aug-02	23.4		579		20.4		536		9.26		432		10.4		459	
Sep-02																
Oct-02																
Nov-02	23.2		548		18.9		486		8.01		391		9.21		450	
Dec-02																
Jan-03																
Feb-03	26.6		586		16.6		533		10.1		439		8.5		411	
Mar-03																
Apr-03																
May-03	22.8		521		23.7		532		11.7		419		12.7		431	
Jun-03																
Jul-03																
Aug-03	25.58		518		21.3		500		8.81		405		9.68		408	
AVG	24		563		21		537		11		432		11		457	

PASCO INDUSTRIAL GROUNDWATER SUMMARY (MW2 - MW9; AUG 99 - AUG 2003)

MW06		MW06		MW07		MW07		MW08		MW08		MW09		MW09	
NO3-N		TDS		NO3-N		TDS		NO3-N		TDS		NO3-N		TDS	
SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE		SINGLE SAMPLE	
mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL	mg/L	QL
8.11		417		19.6		638		27.8		678					
11		458		25.1		544		16.1		650					
11.3		478		27.5		611		34.7		695					
10.5			E	31.5			E	32.2			E				
10.3		438		29.8		584		32.5		582					
10.8		428		28.9		549		32		563					
9.8		453		30.4		590		31.5		622					
9.2		393		28.9		564		30.4		591					
10.2		383		28.6		512		30.7		312					
9		439		28.4		556		27.6		600					
8.9		425		27.5		558		27.4		598					
10.1		440		23.3		587		27		557					
10.57		438		28.4		567		30.2		650					
10.6		448		52		570		30.1		599					
11.52		458		26.1		580		30.9		625					
9.88		440		29.2		542		19		615					
9.16		426		24.2		628		30.7		657					
8.64		453		27.7		690		29.8		612					
8.74		408		25.1		549		29.8		656					
	6		6		6		6		6		6				
													6		6
9.45		459		27.7		525		28.5		603		28.7		573	
11.3		465		24.7		635		29.3		637		28.7		610	
11.3		495		31		685		31		602		30.7		617	
9.28		393		28.4		528		36.1		558		27.2		505	
9.78		398		26.9		590		28.7		589		28.8		526	
9.4		435		30.5		646		30.9		635		28.7		587	
9.12		418		30.9		597		33.4		609		30.4		519	
5.6		432		29.8		625		38.1		622		26.6		549	
9.1		381		32.2		584		33.5		520		30.5		512	
8.91		419		29.3		592		31.3		571		29.8		552	
9.71		433		29		587		30		600		29		555	

APPENDIX 2

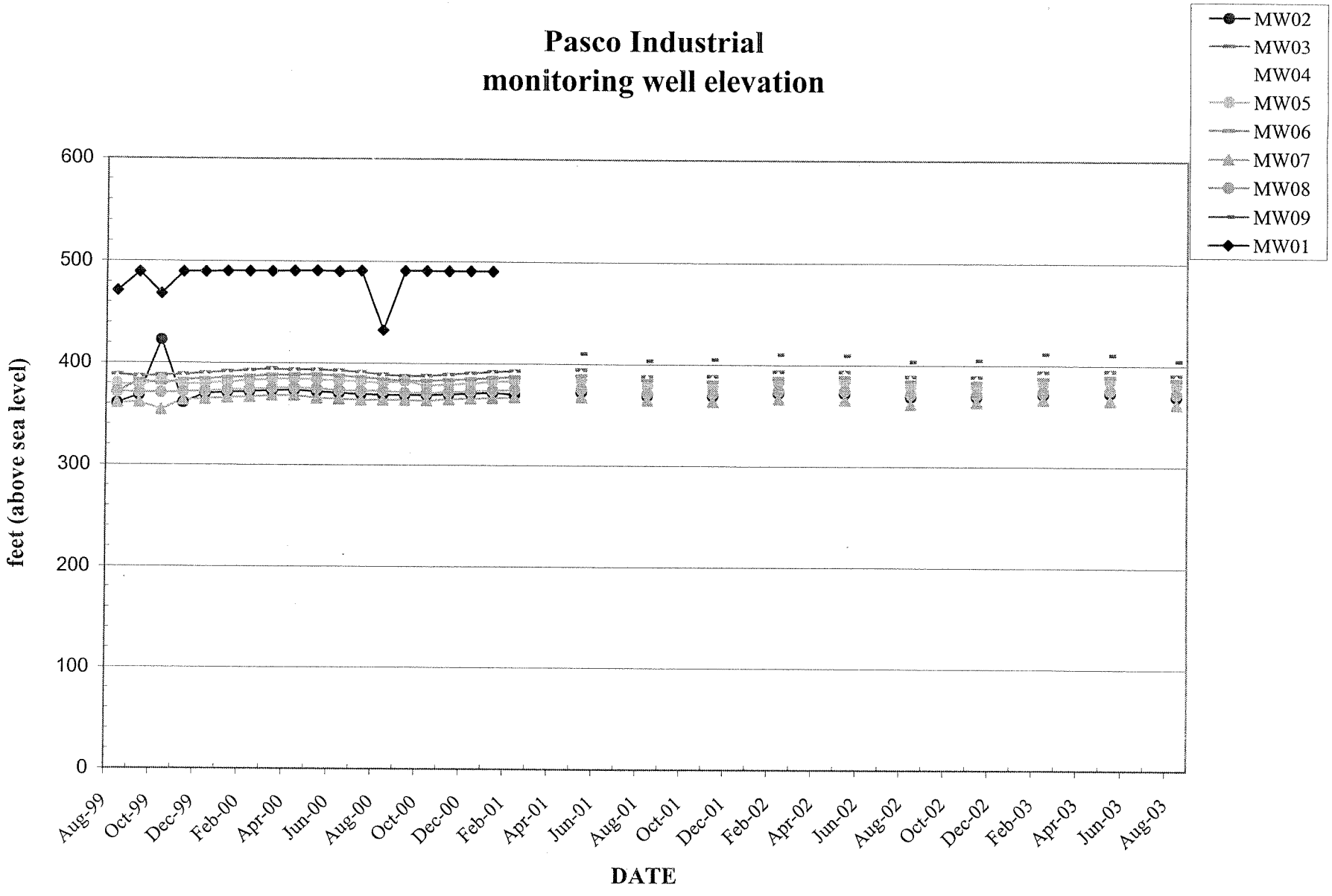

Pasco Industrial
monitoring well elevation
MW02
MW03
MW04
MW05
MW06
MW07
MW08
MW09
MW01
600
500
400
300
200
100
0
feet (above sea level)
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Fig. A2.1

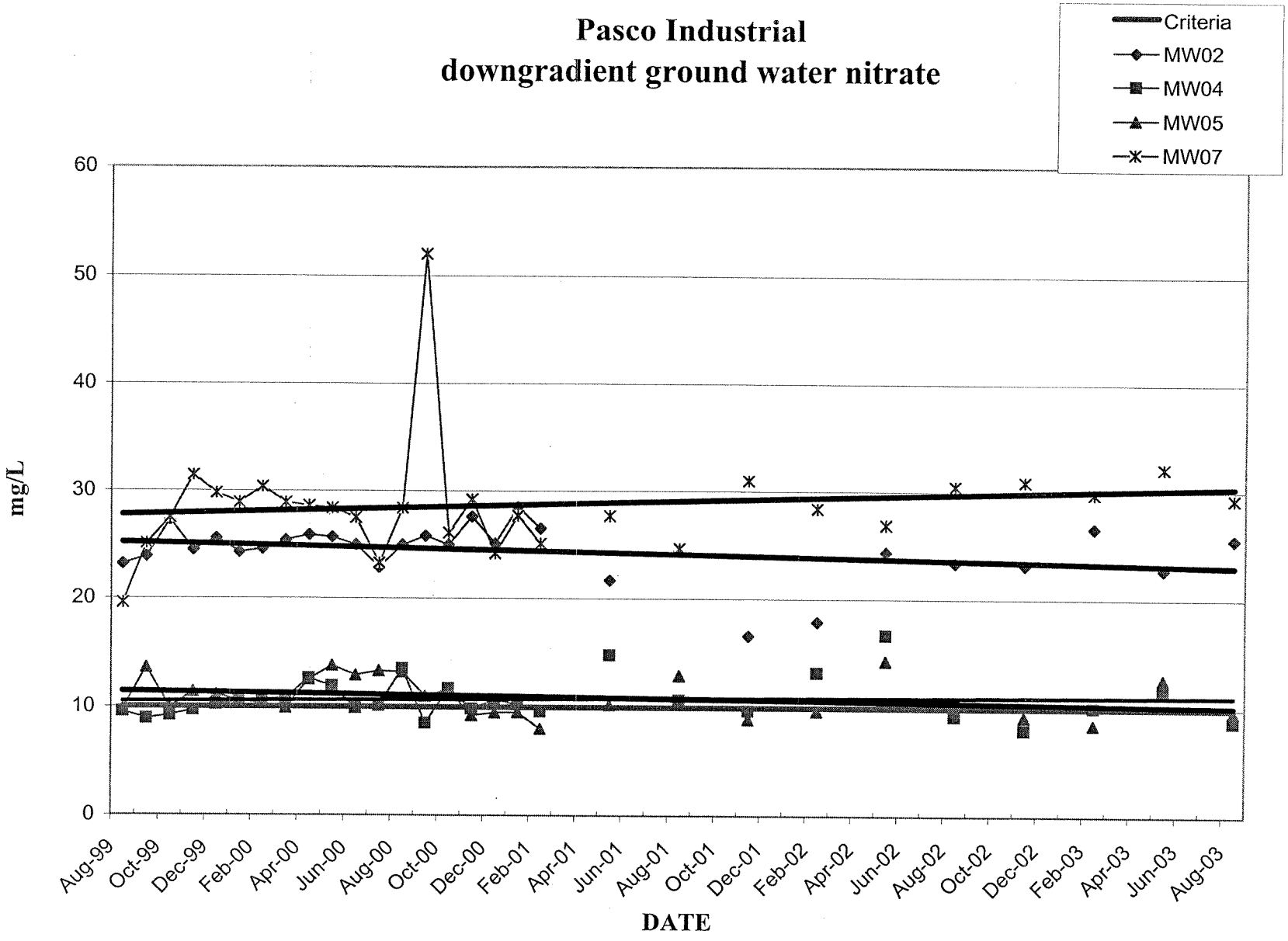

Pasco Industrial
downgradient ground water nitrate
Criteria
MW02
MW04
MW05
MW07
mg/L
60
50
40
30
20
10
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Fig. A2.2

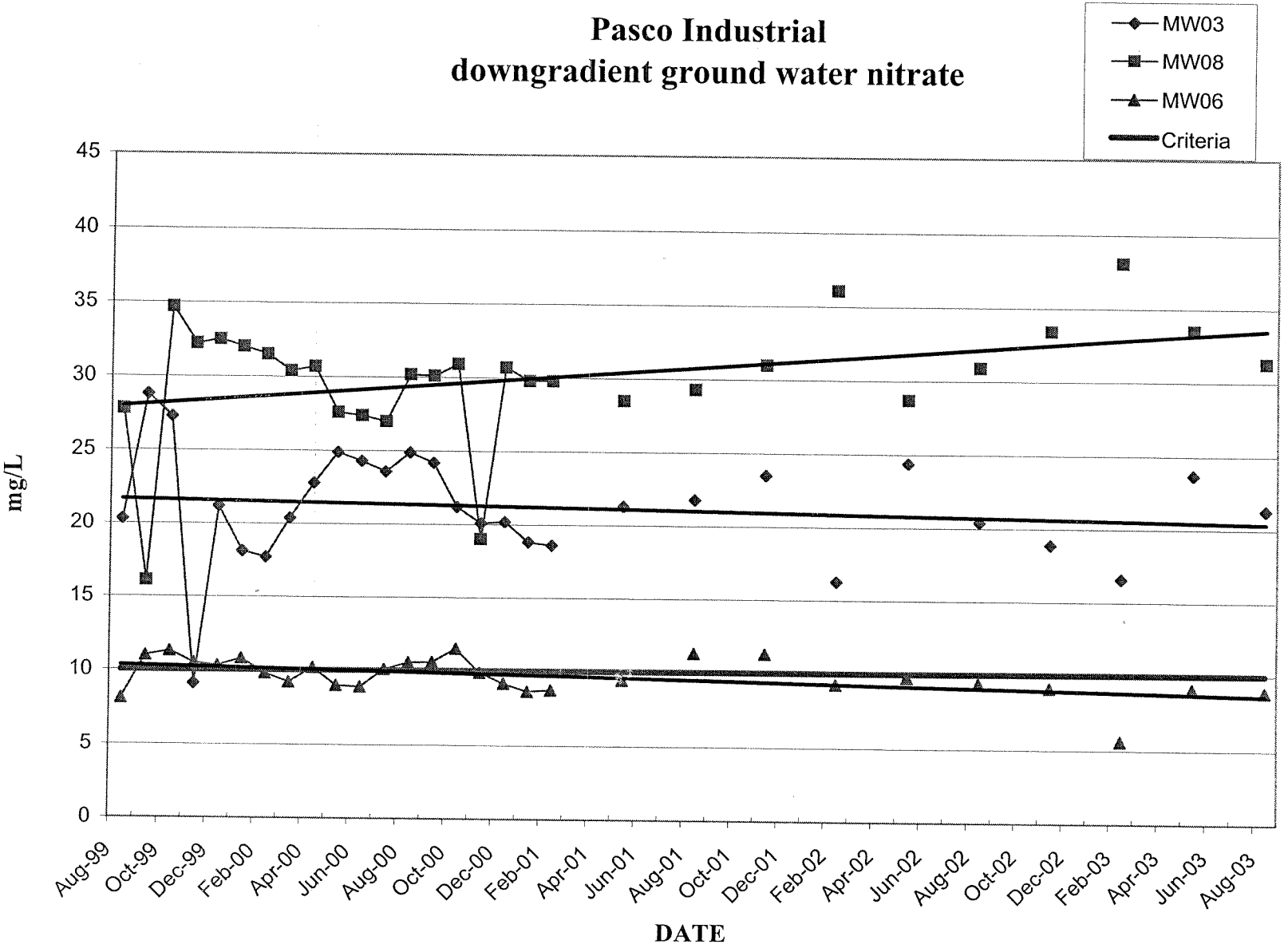

Pasco Industrial
downgradient ground water nitrate
MW03
MW08
MW06
Criteria
mg/L
45
40
35
30
25
20
15
10
5
0
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Fig. A2.3

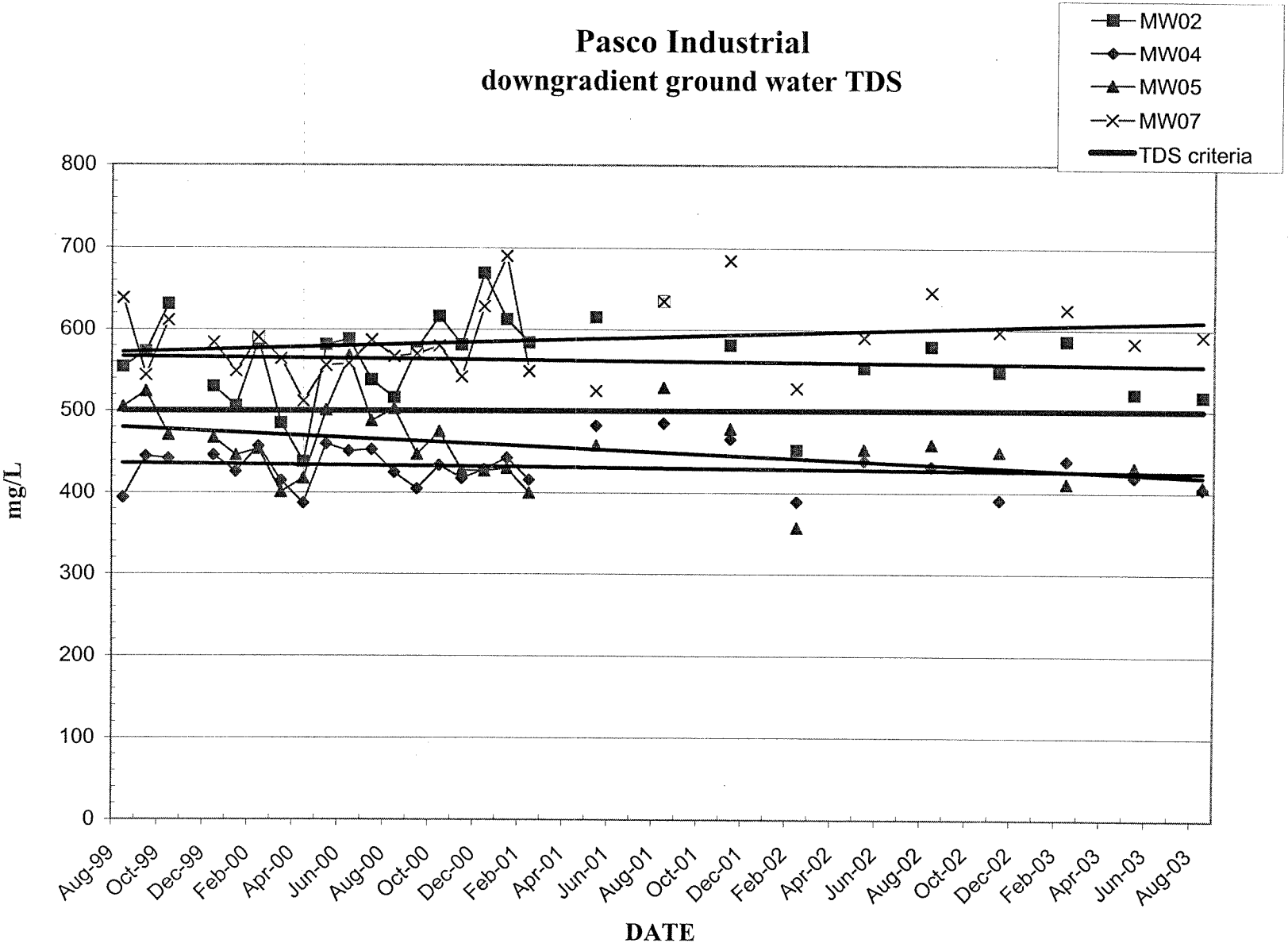

Pasco Industrial
downgradient ground water TDS
MW02
MW04
MW05
MW07
TDS criteria
800
700
600
500
400
300
200
100
0
mg/L
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Fig. A2.4

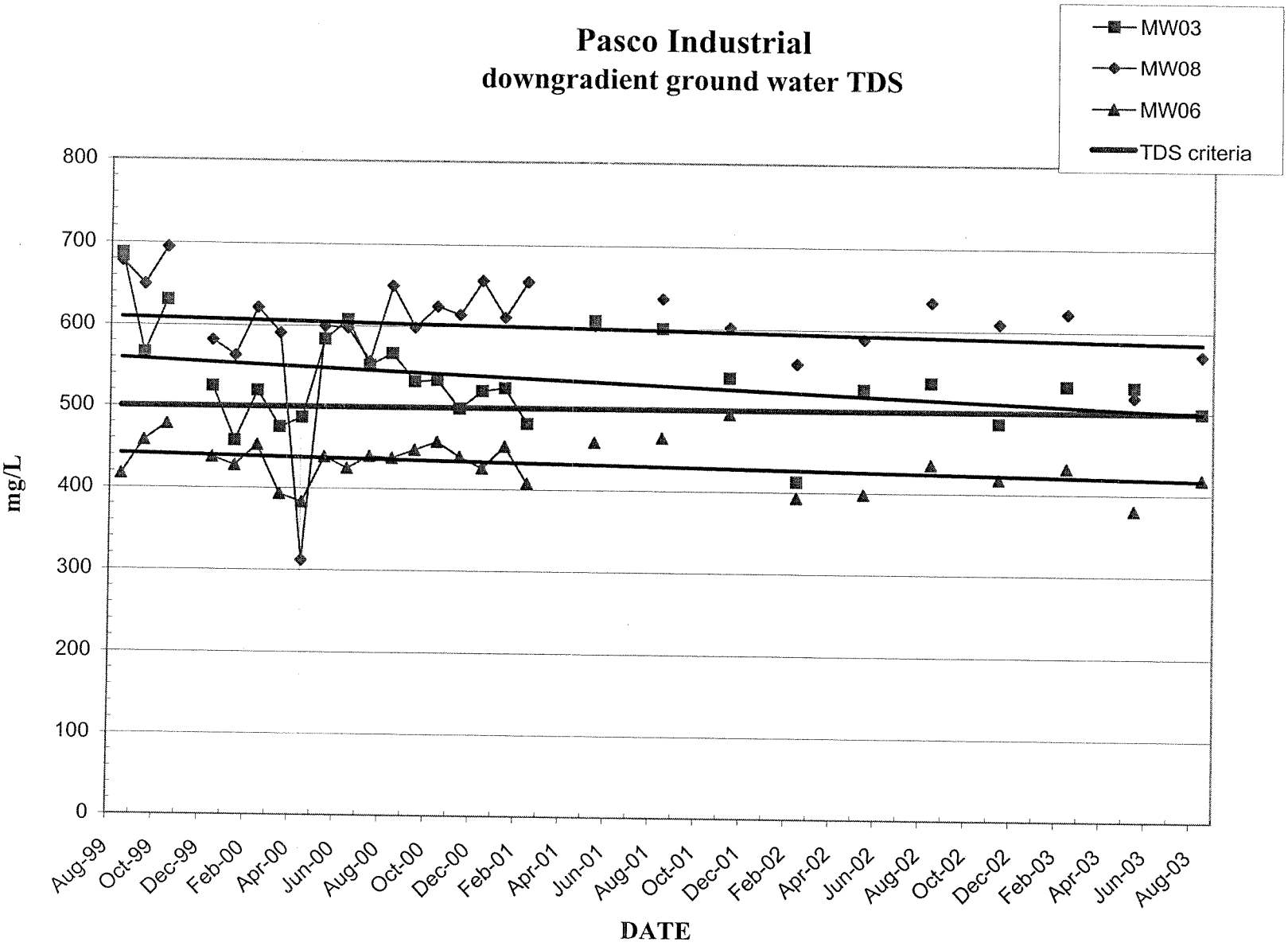

Pasco Industrial
downgradient ground water TDS
MW03
MW08
MW06
TDS criteria
800
700
600
500
400
300
200
100
0
mg/L
Aug-99
Oct-99
Dec-99
Feb-00
Apr-00
Jun-00
Aug-00
Oct-00
Dec-00
Feb-01
Apr-01
Jun-01
Aug-01
Oct-01
Dec-01
Feb-02
Apr-02
Jun-02
Aug-02
Oct-02
Dec-02
Feb-03
Apr-03
Jun-03
Aug-03
DATE

Fig. A2.5